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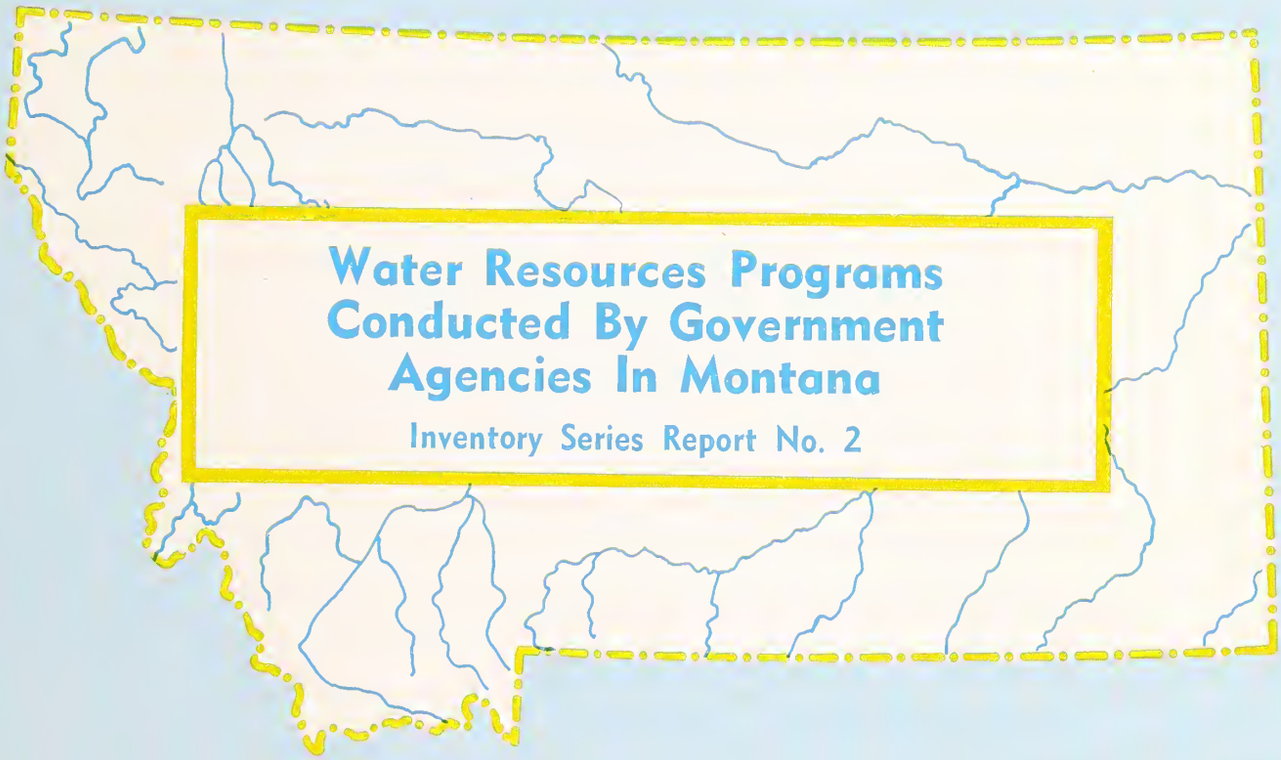
"A Comprehensive Water and Related Land Resources Plan for the State of Montana"



Water Resources Programs Conducted By Government Agencies In Montana

Inventory Series Report No. 2

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"A Comprehensive Water and Related Land Resources Plan for the State of Montana"

INVENTORY SERIES REPORT No. 2

Water Resources Programs Conducted By Government Agencies In Montana

DECEMBER, 1969

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FOREWORD

This publication, prepared by the Montana Water Resources Board, is the second in a statewide water-planning series which the Board will publish utilizing funds provided by Montana's 1967 Legislature together with funds obtained from the Federal Water Resources Council under Public Law 89-80. It is an inventory and description of the activities of Federal and State government agencies in water resources development.

The data contained herein not only lays, in part, the foundation necessary for the preparation of a statewide comprehensive water plan but also supplies basic information for the Board to continue coordination of development and use of the water resources of Montana. Further, it is hoped that the material will prove of interest and utility to all who are interested in water and land resources development in the state.

DOUGLAS G. SMITH

Director

Montana Water Resources Board

Water Resources Programs Conducted By Government Agencies In Montana

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Water Resources Programs Conducted By Government Agencies In Montana

INTRODUCTION

In May, 1968, as a part of the inventory phase of the Comprehensive Water and Related Land Resources Plan for Montana (State Water Plan) the Montana Water Resources Board requested each of the governmental agencies who are conducting programs in water resources work to submit a summary description of the nature, scope, cost, and man-years involved in those programs. As far as is known, all agencies with active programs responded. These agencies totaled 36, of which 15 are State, 20 Federal and one Indian reservation. A summary and preliminary analysis of the responses is the subject of this report. Also included are the responses of five associations whose chief interest is water resource development. The main purpose of this inventory is to determine the areas of endeavor, the disciplines, and functions in which water resources work is being accomplished, and to determine which governmental agencies are doing the work, how much it costs, and estimating how efficiently it is being coordinated.

Most of the data in this report came directly from the agencies involved but, in order to develop a complete picture, some data was adjusted and it has been so designated. It is believed that the coverage is reasonably complete, but financial estimates and estimates of man-years may only be approximate figures although in the right order of magnitude.

The report covers only the expenditures and activities of governmental agencies and funds administered by those agencies. Thus, the report reflects only a fraction of the money and effort now being expended in the management, development, and utilization of Montana's water resources. Still to be evaluated are all private and municipal activities which, in the areas of management and development of water supplies for domestic, industrial, and irrigation uses may well exceed the costs reporated herein for public agencies. The Montana Water Resources Board is presently attempting to evaluate these private efforts and expenditures and will report on them at a later date. Meanwhile, the present effort clearly demonstrates that water resources development in Montana is a big business involving tens of millions of dollars annually. In addition, the proper and efficient coordination of the efforts of the various agencies involved is of prime importance to the people and the State of Montana.

WATER RESOURCES PROGRAMS IN MONTANA BY AGENCY

The following material is extracted from reports by all known State and Federal water resource and related agencies received by the Montana Water Resources Board during the spring and early summer of 1968. The complete reports are on file in the offices of the Board in Helena. Also included are statements by associations that are interested in water conservation and resource development. Since the Board is charged by the 1967 Water Resources Act to "co-ordinate development and use of the water resources of the State so as to effect full utilization, conservation, and protection of its water resources," it seemed necessary and proper to conduct this inventory and report the results to the people of the State.

This information is also basic material which significantly affects the development and implementation of a comprehensive water and related land resources plan.

SUMMARY OF MATERIAL PRESENTED BY THE AGENCIES

STATE AGENCIES

Fifteen state agencies responded to the questionnaire. These agencies have ongoing programs in water resources and thirteen of them expend appreciable funds on these programs. The remaining two agencies are strongly interested in water resources and they influence action or planning for water resources development. Each of these agencies participates in one or several of the areas of disciplines described in a later section of this report with all areas participated in by at least one agency. Ten of the agencies depend to greater or less degree upon federal funds in either grant or matching agreements. Most of the federal funds are given for research, planning, and data collection.

Department of Planning and Economic Development

This department is responsible for development of a state-wide comprehensive plan and for the coordination of all planning in the state toward this end. Thus, the department is highly interested in planning and development of water resources for all uses. The staff is fully aware and keeping abreast of the development of the comprehensive water and related land resources plan by the Montana Water Resources Board. It also is working with local planners, especially on water supply and sewer projects and through the Water Resources Board and other agencies is also kept informed on regional and national water planning and development.

Montana College of Mineral Science and Technology

The program of the College relating to water resources is primarily concerned with ground-water studies and research and includes the following elements:

(1) Education and training of hydrogeologists

(2) Information service

(3) Research

(4) Technical services, (including help on emergency problems usually on request), assistance and advice to other governmental agencies, corporate entities, and individuals.

(5) Coordination of the ground-water cooperative program with the U.S. Geological Survey.

(6) Assist the Water Well Contractors Examining Board in technical matters.

(7) Continuous scrutiny of applications and intentions of industry with regard to overuse or contamination of existing fresh-water aquifers.

Specific projects now being conducted include:

(1) **Research projects presently underway are:** study of water quality and ground-water flow patterns in Summit Valley (Butte area), the relation of ground-water quality to geological environment, the storage, retrieval, and analysis of ground-water data by electronic computer methods, and the use of portable geophysical instruments in exploration for shallow aquifers. A chemical laboratory has been established for analyses of major and minor elements in water. For specific research projects funded in part or wholly by the Office of Water Resources Research, see listing under Montana University Joint Water Resources Research Center (WRRC).

(2) **Field Studies:** Area ground-water studies in Montana are accomplished primarily by the Bureau-U.S. Geological Survey Cooperative Program. Under this program, studies are presently being conducted in the Tobacco-Stillwater Valleys of northwest Montana, eastern Judith Basin (Fergus County), central Powder River Basin (Custer and Powder River Counties), Yellowstone Valley (Billings to Park City), and a continuing study of water levels and artesian pressures in a network of Montana observation wells.

The Bureau has conducted reconnaissance groundwater studies, and presently (with the WRRC) is directing a Ph.D. level graduate study on the "Hydrogeology of the Great Falls Area."

(3) A reconnaissance inventory of ground water in the State to be completed in FY 1968 funded by, and to be used in, the comprehensive State Water Plan now being formulated by the Montana Water Resources Board.

The Ground-Water Branch of the Bureau is funded by $16,750 from the Joint University Water Resources Research Center (federal) and about $26,000 State funds (not including overhead) for fiscal 1968. For fiscal 1969, the WRRC provides $16,750 and the State about $33,000. For this level of funding, the Bureau provides 2½ professional man-years, ½ subprofessional man-year, ½ secretarial man-year, one doctoral student research project, and 5 part-time student assistant positions.

In addition to the foregoing, the Bureau provided $58,275 as State matching funds to the U.S. Geological Survey in fiscal 1968 and $58,775 in fiscal 1969.

Montana Cooperative Extension Service

East Bench Irrigation Project—Dillon

One full-time staff member is assigned to the East Bench Project to conduct an educational program to stimulate efficient water use and increased farm income on the part of irrigated-farm operators in the area. This program is funded through a cooperative agreement with the Bureau of Reclamation.

FY 1969 budget $13,000 ($11,000 Bureau of Reclamation and $2,000 Extension funds.)

Water Resource Education

Two staff members, an Extension Economist and an Extension Wildlife Specialist, devote approximately .15 man-year each to Water Resource Education. The objective of the programs is to increase understanding of the alternatives associated with water development in Montana. The program is carried on with individuals, organizations and agencies.

FY 1969 budget—3 man-year—$4,500.

Montana Legislative Council

The Council does not have an ongoing program in the area of water resources. However, it does supply staff assistance to legislative committees in the formulation of water laws and other bills and there is one subcommittee specifically responsible for following the development of water and coal resources in central and southeastern Montana. This subcommittee is financed by regular research appropriations by the State.

Montana State University

Part of the research program in water resources at Montana State University is described in the section under the Montana University Joint Water Resources Research Center. The following projects are in addition to the work at the Center:

The Limnology of Yellowtail Reservoir and the Big Horn River; Dr. John C. Wright, Professor of Botany, Montana State University. (Grant from Federal Water Pollution Control Administration, $24,641)

The Hydrobiology of the Madison River and Its Headwaters; Dr. John C. Wright, Professor of Botany, Montana State University. (Grant from Federal Water Pollution Control Administration, $26,880)

Ecological Effects of Weather Modification; Dr. John C. Wright, Professor of Botany, Montana State University. (Grant from the National Science Foundation, $215,500)

Study of Yellow Perch in Canyon Ferry Reservoir; Dr. Richard J. Graham, Leader, Cooperative Fisheries Unit, Montana State University. (Contract with Bureau of Sport Fisheries and Wildlife, $5,000)

Predicting frequency and magnitude of peak flows from drainage areas of 1 to 100 square miles in Montana; T. Williams, Associate Professor of Civil Engineering, Montana State University. (Contract with Montana State Highway Commission, $202,100)

Development of Airborne Radiometric Snow Survey System; Paul W. Jordan, Research Engineer, Montana State University. (Contract with Atomic Energy Commission, $15,203)

Mountain Snowpack as an Environmental Factor; Dr. Arlin Super, Associate Professor of Meteorology, Montana State University. (Contract with the Department of the Army, $36,864)

Waterfowl Production on Reservoirs Within Pastures Managed Under the Restoration System; Dr. Robert L. Eng, Associate Professor of Zoology, Montana State University. (Contract with the Bureau of Land Management, $4,000)

Membranes For Reverse Osmosis Desalination; Dr. Robert L. Nickelson, Professor of Chemical Engineering, Montana State University. (Grant from the Office of Saline Water, $45,210)

Atmospheric Water Resources Research; Dr. Arlin Super, Associate Professor of Meteorology, Montana State University. (Contract with the Bureau of Reclamation, $288,000)

Montana Water Pollution Control Council

This Council was created in 1955 and is composed of the directors of the Department of Health, Fish and Game, and the Water Resources Board and four members representing industry (two members), agriculture, and municipal government. Shortly after its creation the Council set up and the State adopted water classifications and standards of purity. These standards were revised and approved by the Federal Water Pollution Control Administration in 1967, in accordance with requirements outlined in the Federal Act of 1965 establishing that agency.

The duties and powers of the Council clearly indicate the nature of its programs and their significance in water resources planning. These duties and powers include:

(1) Establish and modify the classification of all waters in accordance with their present and future most beneficial uses;

(2) investigate means of eliminating materials which pollute state waters, and prevent pollution that is detrimental to the public health, recreation, agriculture, industry, animals, fish, or aquatic life;

(3) adopt rules to guide the state board and department in the administration of this act;

(4) adopt a comprehensive program for prevention of pollution of waters;

(5) recommend and encourage research and demonstrations relating to water pollution;

(6) direct the state board and department regarding any action necessary as a result of research or demonstrations;

(7) formulate standards of water purity and classification of water according to its most beneficial use giving consideration to the economics of waste treatment and prevention;

(8) hold any hearings necessary for the proper administration of this act, receive complaints, and make investigations;

(9) utilize staff services of the state board and department as they are able to furnish within budgetary limits;

(10) exercise all incidental powers necessary to carry out the provisions of this chapter.

Montana Water Resources Board

Coordinator for all local, state and federal water programs in Montana

The Water Resources Board is the legally designated agency to coordinate all water programs and activities in Montana, and it must prepare a comprehensive multiple-purpose State Water Plan. This plan will provide guidelines for the development and conservation of water and related land resources in Montana for the next 50 years.

Construction of water projects

Since its establishment, the Board has engaged in the construction of water projects designed to fulfill the needs of Montana users.

Operate and maintain existing projects

The Board has the responsibility along with the project users to operate and maintain projects.

Water Resources Survey

The Board maintains a continuing survey and inventory of claims, rights, adjudications and uses of water. Surveys are conducted for each county.

Administer the State's groundwater code

The Board is the authority to administer the Ground Water Code of Montana. This authority permits the Board to set up controlled ground water districts and to regulate ground water use in such a district.

Weather modification

The Board is the agency which authorizes and regulates weather modification in Montana. This includes licensing of persons and firms who propose to engage in weather modification as well as studying the need and possible impact of weather modification in any area.

Stream Measurement Program

The Board cooperates with the U.S. Geological Survey in a program to measure stream discharge, water quality, and sediment content.

Montana Universities Joint Water Resources Research Center

The Montana University Joint Water Resources Research Center is organized to include research projects at three units of the University System—Montana State University, University of Montana, and Montana College of Mineral Science and Technology. The Director's office for the Center is at Montana State University. The research program is planned and coordinated by a Coordinating Council made up of members from the three University System units. Administration of the Federal funds is through the Office of Water Resources Research (United States Department of the Interior).

The Water Resources Research Act provides three different categories of funding to the 50 states and Puerto Rico. First, is a uniform allotment of $100,000 to each water research center. Second, is a program of individual matching grants in which all of the centers submit competitive projects to the Office of Water Resources Research. Only universities having authorized water research centers are eligible for these competitive grants. The third category of funding also involves competitive projects but the eligibility is broader. All institutions of higher education (public and private) are eligible to compete for grants as well as other state and federal agencies and private research organizations. Matching of funds is not mandatory but some degree of cost sharing may be required.

The program of the Montana Center is made up largely of research projects that fall into one of five groups:

(1) Hydrologic and related studies

(2) Economic, social and legal studies

(3) Ground water resources

(4) Water, soil and plant relations

(5) Water quality

A major research project involving a matching grant was recently awarded to the Center by the Office of Water Resources Research. This project concerns the development of a computer model for the Montana State Water Plan. The grant is in the amount of $111,150 over a period of three years beginning July 1, 1968. The Montana Water Resources Board has agreed to provide the matching funds for the first year and will request the required matching funds for the second and third years from the 1969 Session of the Montana Legislature.

Active research projects during the fiscal year beginning July 1, 1968 are as follows: (Projects designated with "A" numbers are part of the allotment program and are supported by the allotment of $100,000 per year from the Office of Water Resources Research):

A-007 Mountain Precipitation and Distribution; Dr. Arlin Super, Associate Professor of Meteorology, Montana State University.

A-008 Hydrologic Analysis, North Fork, Elk Creek; Dr. Richard Konizeski, Hydrologist, University of Montana.

A-009 Opportunities for Water Resource Utilization; Dr. Richard J. McConnen, Professor of Agricultural Economics and Economics, Montana State University.

A-012 Inventory and Evaluation of Ground-Water Resources, Summit Valley; Maxwell K. Botz, Assistant Professor of Geology, Montana College of Mineral Science and Technology.

A-014 Coding and Machine Processing of Ground-Water Data; Mexwell K. Botz, Assistant Professor of Geology, Montana College of Mineral Science and Technology.

A-015 Transpiration Rates of Conifers; Dr. Mark J. Behan, Assistant Professor of Botany, University of Montana.

A-016 Aquatic Plant Resources of Western Montana; Dr. Sherman J. Preece, Associate Professor of Botany, University of Montana.

A-017 A study of Natural Water Systems in Western Montana; Dr. Richard A. Solberg, Director, University of Montana Biological Station.

A-019 A Geologic, Geochemical, and Microbiologic Study of Flathead Lake; Dr. Arnold Silverman, Assistant Professor of Geology, University of Montana.

A-023 Gravity Investigation of Water-Bearing Strata in Swan Valley, Montana; Dr. Gary W. Crosby, Assistant Professor of Geology, University of Montana.

A-025 Computer Simulation of the Hydrologic System of a Mountain Watershed; Dr. Darrel E. Dunn, Montana State University.

A-026 A Study of Water Resources Research Needs in Montana; Dr. Charles C. Bradley, Montana State University.

A-027 Microbiological Studies In an Open and Closed Watershed; Dr. William G. Walter, Professor of Microbiology, Montana State University.

A-028 Water Resources in Sourdough and Middle Creek Watershed; Theodore T. Williams, Assistant Professor of Civil Engineering; Montana State University.

A-029 Hydrogeochemical Investigation of Selected Watersheds In Southwestern Montana; Marvin R. Miller, Instructor in Geology, Montana College of Mineral Science and Technology.

A-030 Water and Recreation Study of the Blackfoot River System; Dr. Carling I. Malouf, Professor of Anthropology, University of Montana.

A-031 Legal Research to Improve Montana Water Laws; Albert W. Stone, Professor of Law, University of Montana.

A-032 The Effect of Copper on Algae of the Big Blackfoot River; D. Richard P. Sheridan, Assistant Professor of Botany, University of Montana.

Projects designated with "B" numbers are matching grants for the amount indicated.

B-014 Digital Instrumentation and Telemetry for Water Resources Research; Dr. Donald K. Weaver, Jr., Professor of Electrical Engineering, Montana State University (23,800) Two years.

B-024 Water Dating Techniques As Applied to the Missoula Valley Ground-Water Reservoir; Dr. Richard Konizeski, Hydrologist, University of Montana. (14,800) One year.

B-025 Hydrological Data Acquisition Through Remote Reconnaissance Systems; Frederick L. Gerlach, Assistant Professor of Forestry, University of Montana. (21,000) Two years.

B-029 Development of a State Water Planning Model; Dr. Donald W. Boyd, Assistant Professor of Industrial and Management Engineering and Theodore T. Williams, Assistant Professor of Civil Engineering, Montana State University. (111,150) Three years.

For the first time, the Montana University Joint Water Resources Research Center has been awarded a grant in the third category of funding discussed

earlier. This category of research projects (Title II of the Water Resources Research Act of 1964) must be presented to Congress. The list of projects remains there for 60 days and if a project is not questioned, it is considered approved.

C-1443 Social Change In A Water Resource Development Area: Social Aspects of the Construction Phase of Libby Dam; Hugo J. Tureck, Assistant Professor of Sociology, Montana State University. (32,-278) Two years.

The research program of the Water Resources Research Center will involve approximately 16.5 man-years during the 1968-69 fiscal year.

State Department of Health

The work of the Department primarily involving water resources includes a pollution control program, a municipal drinking water program, and a waste water program.

The pollution control program consists of several elements including surveillance and enforcement, control facilities, training, studies and planning, public information, and administration. Most of the work centers around enforcement and education in regard to the water standards recently developed and adopted by the State. In fiscal year 1968 it involved about 4.8 man-years. It is estimated that it will involve 7.0 man-years in 1969 and 10.5 man-years in 1970. The budget for fiscal year 1968 and estimated budget for 1969 and 1970 are given below:

The drinking water program includes review of plans for all new work, routine check on all supplies for bacteriological quality once a month or more frequently, same on chemical quality once each five years or more frequently, routine inspection of all supplies at least once a year, maintenance of equipment for emergency disinfection of water supplies, conducting an annual school for operators, and notification by telephone whenever a municipal supply is found not to be of satisfactory quality. A total of 3.5 man-years is spent on this program including engineering, bacteriological, chemical, and secretarial services with most of the cost borne by State appropriated funds.

The waste water program involves maintenance of an extensive monitoring program, review of plans for all new treatment facilities and sewer connection systems including those for all new subdivisions, conducting schools for training of operators, and inspection annually of all treatment plants in the State with accompanying assistance to plant operators. The Department of Health also provides secretaries for the boards which certify all water and waste-water operators and all plumbers and is a member of the water well drillers examining board. Funding and manpower estimates for this program are included in the estimates for pollution control.

State Forester

The Office of State Forester carries on programs dealing with the management of State and privately-owned forest land in Montana, such programs having an effect on the watershed of the State. An enumeration of the various programs is:

(1) Forestry assistance to private landowners, in cooperation with the Cooperative Forest Management Act of 1950—a federal program;

(2) participation in Public Law 566—a small Watershed Act;

(3) timber sales on State land;

(4) fire protection on State and private land.

The operation of all of these programs directly affects the water resources of the State. These programs are designed for wise use of the land, includ-

Program Element	1968	1969	1970
Pollution control—Surveillance and Enforcement	$ 45,327	$ 72,631	$ 95,000
Water pollution control facilities	14,891	18,000	25,000
Training	5,541	7,000	10,000
Studies and Planning	7,914	9,000	35,000
Public Information	1,399	2,000	8,000
Administration	892	------	------
Miscellaneous	7,520	------	------
TOTAL BUDGET	$ 83,487	$108,631	$173,000
FEDERAL FUNDS	$ 38,514	$ 38,200	$ 38,200
STATE FUNDS	$ 44,973	$ 70,431	$134,800

ing watershed management. Proper application of the programs helps to cut down on excessive runoff and sedimentation, and helps to improve the watershed capabilities of forested lands. One program, Public Law 566, is primarily designed with water in mind.

Public Law 566, the Small Watershed Program, is a federal program administered by the U.S. Soil Conservation Service. Through cooperation with the U.S. Forest Service, which has been designated as the subject matter specialist in forestry, the Office of State Forester becomes interested in each watershed proposal that involves forest land. In Fiscal Year 1969, the State of Montana Forestry Department offered approximately two man-months to this program. One-hundred percent of the financing has come from the federal government. In future years, the State Forester is anticipating an estimated effort of approximately four man-months per year.

State Highway Department

The Highway Commission has two programs that are active and may be considered as water resources programs.

A summary of the programs are as follows:

(1) A project being done by the United States Geological Survey in cooperation with the United States Department of Transportation and the Montana Highway Commission, to collect hydrologic data for use in defining the magnitude and frequency of floods from small drainage basins in Montana. The ultimate objective is to obtain knowledge for proper design of a culvert or other hydraulic structure. The project is of the continuing type with periodic analyses of peak flow data. The program was started in 1954.

It is financed by Highway Research funds consisting of 75 percent Federal and 25 percent State monies. Presently the total cost of the project is $21,000 annually. The estimate for the man-years involved is 14.1 through the 1969 Fiscal Year and 3.5 additional through Fiscal Year 1974.

(2) The Drainage Correlation Research Program conducted by Montana State University was started in 1963. The objective is to study the hydrology of a selected few of the watersheds included in the U.S.G.S. Program of Item 1. Studies of precipitation measurements, soil types, topography, land use, continuous flow measurements, etc., are being used to determine flood frequencies and magnitudes needed in hydraulic design. Estimated cost of the project is $25,000. The estimated man-years involved is 10.6 through the 1968 Fiscal Year and 30 man-years through Fiscal Year 1970.

There has been some interest in incorporating small dams into highway construction. Although several sites have been selected and preliminary studies have been made, no man-years of time can presently be estimated. It is believed that future planning will consider dams implemented into highway construction and a better estimate can then be made.

State Soil Conservation Committee

The general objectives of the State Soil Conservation Committee in water resources are:

(1) To organize Soil and Water Conservation Districts to carry out their own programs to include water conservation, development, and utilization. Fifty-eight Soil and Water Conservation Districts are presently organized and operating, which include all of Montana except Prairie County and part of Custer County. Incorporated towns and cities were generally excluded, but they are now coming into districts and presently there are thirteen.

(2) To offer assistance as may be appropriate to Soil and Water Conservation Districts in carrying out their programs and powers. This assistance depends on the financing that the legislature provides, and can include financing many types of water programs, projects or practices. Currently the State Soil Conservation Committee provides about 1.5 man-years of administration, coordination, information, and advisory activity.

(3) To accelerate watershed protection and flood prevention planning under P.L. 566 currently providing $50,000 (next biennium $75,000) a year to the Soil Conservation Service.

(4) To secure the cooperation and assistance of the United States and any of its agencies, and of the agencies of the State, in the work of Soil and Water Conservation Districts. Presently the U.S. Department of Agriculture, Department of Interior, and several state agencies have working agreements with the Districts. There are opportunities to develop these further. The State Soil Conservation Committee presently works closely with many agencies of government and is represented on several boards and committees.

State Soil and Water Conservation Districts

There are 58 Soil and Water Conservation Dis-

tricts in Montana with which the State Soil Conservation Committee has certain administrative functions and works closely. They all have active water resource or water-related long range programs and annual work plans. They include erosion control, water spreading, ponds, proper land and water use, tillage, irrigation, water based recreation, and comparable projects. Soil and Water Conservation District programs of water resources in Montana are broad based and are pointed toward all uses of water and total resource development.

Over 300 supervisors give of their time without pay which currently involves 3 or 4 man-years total. Soil and Water Conservation Districts currently receive about $40,000 a year of county funds and earn $140,000 a year from their contracting services, etc. Districts employ an estimated 5 man-years of clerical help. An additional 5 man-years is probably realized from the federal work-study program.

The Districts rely on the Soil Conservation Service for technical assistance, and upon the Agricultural Stabilization and Conservation Service, and others, for cost-sharing assistance. The Extension Service at Montana State University and Montana Experiment Stations work closely with Soil and Water Conservation Districts in their programs.

Soil Conservation Districts are co-sponsors of 52 watershed applications. They also provide guidance and participate in snow surveys, the conservation needs inventory, and soil surveys that are used as a basis for most conservation practices, and land use changes.

In addition to county funds in the amount of $33,940, much time and service is contributed by State and local governments, district supervisors, private individuals, and others. Cost-sharing funds spent by the Districts are shown in the section on the Agricultural Stabilization and Conservation Service.

University of Montana

(1) Research projects underway at the University and funded in part or wholly by the Office of Water Resources Research, Department of the Interior are listed in the section on the Montana University Joint Water Resources Research Center.

(2) An economic base study involving economic analysis of water and related resources is being conducted by the Bureau of Business and Economic Research under the direction of Dr. William D. Diehl. The project might be called an economic productivity analysis and may be categorized in four parts:

(a) The economic demand for irrigation and related resources.

(b) The economic demand for municipalities and related resources.

(c) The economic demand for recreation and related resources.

(d) The economic demand for industry and related resources.

The objectives of this analysis are to provide a basis for determining output changes of these general water use classifications associated with particular increments of water use. This analysis will provide indications of how to achieve efficient allocations of water within the state.

The project is funded by the U.S. Housing and Urban Development Department under Section 701, and by State funds furnished by the University, the Montana Water Resources Board, and the Montana Department of Planning and Economic Development.

(3) A study of the business and industrial development potential as a result of construction of the Libby Dam. This study is financed by a grant to the Economics Department from the Economic Development Administration (U.S. Department of Commerce).

INDIAN RESERVATION

Northern Cheyenne Tribal Council

Lands involved are mainly Indian Allotted lands in multiple heirship status adjacent to (west of) Tongue River on the Northern Cheyenne Indian Reservation.

For over thirty years attempts have been made to put potentially irrigable lands along Tongue River to beneficial use through land use planning and development. These have met with very little success due to lack of interest and irrigation equipment and skill; and, partly due to the multiple ownership pattern of small tracts along the river. They have succeeded in irrigating a few hundred acres (a fraction of the potential from the Birney Canal or from pump sites along the river). But this has fluctuated up and down over the years. Currently about 20 to 40 acres per year are developed.

Since 1938 the U.S. Government has purchased annually 7,500 acre feet of Tongue River water for use by the Northern Cheyenne Tribe at a cost of

$9,750 per annum. The best use of water appears to be in the direction of industrial development as indicated by the accelerated interest being shown in vast coal deposits. The government has tentatively set aside 7,000 acre feet of storage water earmarked for industrial developments; the remaining 500 acre feet should meet current and future irrigation needs at the present rate of development.

Until a more definite determination is made concerning water needs in development of the coal resources, major irrigation development is not anticipated on the reservation. It would not be possible to give estimates as to man-years involved in programs being carried on in the water resource field as there is not a definite program being followed.

FEDERAL AGENCIES

Of the 20 federal agencies with active water resource programs in Montana, two stand out in terms of size and cost of programs. These are the U.S. Corps of Engineers and the U.S. Bureau of Reclamation who spend approximately three-fourths of all governmental funds expended in the state. Currently the Corps of Engineers alone is expending more than 63 percent of those funds in connection with the construction of Libby Dam. Most of the programs of the remaining eighteen federal agencies are in research, planning, cost-sharing, data collection, and development and management.

Department of Agriculture

Agricultural Research Service

Research work conducted by the Service and directly related to water resources include:

SWC W6-dSid-1—**Effects of Range Management Practices on Surface Runoff.**

(1) **Mont. S-67-3**—Effects of range management practices on surface runoff from panspots and saline upland range sites in southeastern Montana.

Location: Project is on public domain in southeastern Montana approximately 15 miles south of Ekalaka.

Objective: The objective of this experiment is to evaluate the effects of site and contour furrowing on surface runoff from rangelands in southeastern Montana.

(2) **Mont. S-67-4**—Precipitation characteristics related to surface runoff from panspot and saline upland range sites in southeastern Montana.

Location: Project is on public domain in southeastern Montana approximately 15 miles from Ekalaka.

Objectives: Objectives of this experiment are to identify and evaluate precipitation characteristics that influence rates and amounts of surface runoff from range lands in southeastern Montana.

Research work indirectly related to water resources that is conducted by the Service includes:

(Note: This work may more appropriately be considered related to soil resources although many of the studies deal with water-use efficiency or cultivated and native plants)

SWC W7-dSid-10—**Managing Snow and Runoff to Increase Water Supplies for Farm Use in Eastern Montana.**

Mont. S-67-1 — Water harvesting potential from rainfall and induced snowdrifts in northeastern Montana.

Location: A silty range site near Sidney, Montana.

Objectives:

1. To determine the influence of local topography on the annual water yield of rain trap installations.

2. To determine criteria for snow fence placement relative to a given catchment area for maximum snow deposition.

3. To determine water balance of snow deposited on the rain trap catchment areas.

SWC W13-dSid-3—**Practices for Control of Water Erosion and Runoff in North Central Montana.**

Mont. S-66-2 — An evaluation of seedbed preparation and mulching techniques to establish grass on waterways constructed for nonerosive removal of runoff water from farmlands.

Location: Experiments on privately owned lands and the Soil and Water Conservation Research Farm north of Culbertson, Montana.

Objectives:

1. To determine the effect of different methods of grass establishment on stand and subsequent growth of grass cover on newly constructed waterways.

2. To determine the influence of rates of straw mulch on soil temperature and water within the seedbed zone of newly seeded grasses.

SWC W14-dSid-4—**Grass Barriers, Cropping, and Residues for Wind Erosion Control in the Northern Great Plains.**

Mont. S-64-1 — Double-row perennial grass barriers for wind erosion control and moisture conservation.

Location: Sidney Dryland Annex, Eastern Montana Branch Station, 7 miles west of Sidney, Montana.

Objectives:

1. To evaluate the possibility of using double-row grass wind barriers in the field for wind erosion control, snow trapping, and moisture conservation.

2. To partially evaluate wind barrier interval in relation to climatic factors and crops grown between barriers.

SWC W15-dSid-5—**Stubble Mulch Management for Maximum Production and Conservation of Soil and Water Resources in the Northern Great Plains.**

Mont. S-63-1—Effect of residue level on moisture conservation and winter wheat survival in the Northern Great Plains.

Location: Sidney Dryland Annex, Eastern Montana Branch Station, 7 miles west of Sidney, Montana.

Objectives:

1. To determine the effect of residue level on the moisture content of the surface soil and total moisture storage in soils when natural and simulated fall and spring moisture conditions are imposed while growing a winter wheat crop.

2. To evaluate the effect of various residue levels and moisture treatments on soil temperature and the physical conditions of the soil during and after spring thaw and the relationship of these factors to winter survival of winter wheat.

3. To establish if there is a relationship of soil moisture and temperature conditions in the surface 0 to 15 cm of soil to winter killing of winter wheat.

Mont. S-63-2—Effect of incorporating various levels of residue on soil N and P availability in a spring wheat-fallow rotation.

Location: Project being conducted on the Soil and Water Conservation Research Farm, Culbertson, Montana.

Objectives:

1. To determine the effect of incorporating various residue levels at seeding time on plant growth and nutrient uptake of N and P.

2. To determine the effect of incorporating various residue levels maintained on the soil surface during fallow on soil N and P availability when incorporated at seeding.

3. To evaluate the effect of residue level during fallow on moisture conservation.

4. To determine the residue deterioration losses of various initial residue levels during the fallow period.

Mont. S-65-1—Effect of quantity and position of crop residue on the growth of winter wheat.

Location: Sidney Dryland Annex, Eastern Montana Branch Station, 7 miles west of Sidney, Montana.

Objectives:

1. To evaluate new techniques of residue management for a wheat-summer fallow crop system.

   a. To determine the influence of residue quantity and position on the growth of winter wheat.

   b. To determine the effect of residue quantity and position with respect to the drill row on soil moisture conditions, soil temperature, plant growth, and plant uptake of N and P.

c. To determine the influence of residue quantity and position on winter wheat survival.

Mont. S-66-3—Quantity and forms of N in a glacial till soil as influenced by various quantities of straw residue and the source of N applied.

Location: Project located on the Soil and Water Conservation Research Farm, Culbertson, Montana.

Objectives:

1. To determine, qualitatively and quantitatively, selected forms of N in soils as influenced by residue quantity.

a. To evaluate the effect of residue quantity and the source of N applied on NO_2-N and NO_3-N in the soil following residue incorporation.

Mont. S-67-7—Effect of straw and artificial mulches on temperature and content of soil and morphological development of winter wheat.

Location: Dryland Annex, Eastern Montana Branch Station, 7 miles west of Sidney, Montana.

Objectives:

1. To determine the effect of soil temperature and water on selected morphological characteristics of winter wheat under field conditions.

a. To determine the relationship of soil temperature and the following morphological characteristics during early growth of winter wheat: crown location, number of tillers, number of adventitious roots, head size (growth stages 3, 4, 5, and 11.4), and total plant growth from the beginning of growth in the spring through heading.

b. To partially evaluate the interrelationship of soil water and temperature on the phenology of winter wheat as mentioned above.

2. To establish usable techniques and procedures for measuring individual plant characteristics under field conditions and to determine those plant characteristics which are significant components of final grain yields.

SWC W18-dSid-6—**Water Conservation on Dryland in the Northern Plains.**

Mont. S-66-5 — Soil-water recharge, storage and depletion as influenced by the capacity of the soil fluid flow system of crop and range lands.

Location: Dryland Annex, Eastern Montana Branch Station, 7 miles west of Sidney, Montana.

Objectives:

1. To relate the capacity of the soil fluid flow system to the rates and patterns of precipitation penetration and evaporation extraction.

2. To develop measurement techniques for physically characterizing large-port flow systems in the soil.

SWC W20-dSid-8—**Soil - Water - Plant - Climate Relations in the Northern Plains.**

Mont. S-67-8—The energy balance and water budget of native range in eastern Montana.

Location: Lone Tree Ranch, Inc., Sidney, Montana.

Objectives:

1. To determine the heat and water budget of native range plant communities.

2. To determine how practices such as miniature fallow strips affect the partitioning of the heat load and the water budget.

Mont. S-67-9 — Microclimate and growth of sugar beets as influenced by wind barriers. **Location:** Sidney, Montana.

Objective: To study the potential of wind barriers in relation to earlier establishment and growth of sugar beets.

Mont. S-67-10 — The influence of microenvironment and internal and external characteristics of small grains on partitioning of the heat budget, water use and transpirational loss.

Location: Curtis Rasmussen Farm northwest of Sidney, Montana.

Objectives: To evaluate different plant characteristics that are available or that can be incorporated into isogenic lines of small grains with regard to their effects on water use.

SWC W21-dSid-9—**Soil and Fertilizer Management Systems for Efficient Use of Crop and Range Lands.**

Mont. S-62-2—Seed production and water-use efficiency of some introduced grass species planted in wide rows.

Location: Project is located on the Soil and Water Conservation Research Farm, Culbertson, Montana.

Objectives:

1. To investigate the effects of row width and fertilizer treatments on forage production, grass seed production, and water-use efficiency of four grass species.

2. To provide a project having demonstrative value for observation by local agencies and farmers.

Mont. S-66-1 — Chemical and physical soil properties of benchmark glaciated soils as influenced by current and residual post-year fertilizer placements.

Location: Oscar Hippe, George Luebke, and Adolph Sundvold farms in Roosevelt County, Montana; and Bill Wagner farm in Sheridan County, Montana.

Objectives:

1. To determine the effect of rate and depth of fertilizer placement on:

   a. Water-use efficiency, total plant water use, and water extraction patterns.

   b. The accumulation of nitrate and nitrate-nitrogen in the soil and their subsequent effect on plant growth and uptake of nitrogen.

2. To determine what factors are involved in balancing available soil moisture with N and P resulting from placement and quantity of applied fertilizer.

3. To correlate plant growth and nutrient uptake with soil chemical properties in relation to moisture supply and climatic variables.

Mont. S-66-4—Miniature fallow strips on native rangelands: Their effect on the microenvironment and the associated vegetative response.

Location: Lone Tree Ranch, nc., Sidney, Montana.

Objectives:

1. To determine the effects of several combinations of alternate fallow and vegetation strips on the microenvironment and the associated vegetation.

2. To determine the relationships between changes in the microenvironment and changes in vegetative characteristics.

3. To determine response of native range plants to fertilizer under increased soil water.

Mont. S-67-2 — Effect of interseeding and pitting on productivity of a sandy range site.

Location: Gartner-Denowh Angus Ranch approximately 4 miles northwest of Sidney, Montana.

Objectives:

1. To determine the effectiveness of interseeding and pitting for improving forage production on a deteriorated native range and on an old stand of crested wheatgrass.

2. To evaluate several species for their suitability as range plants in a specific adaphic and climatic environment.

3. To determine the effect of interseeding and pitting on the microenvironment and associated response of native vegetation and interseeded species.

Mont. S-67-5 — Soluble P and spring wheat production as influenced by the initial and residual effect of applied P.

Location: Soil and Water Conservation Research Farm, Culbertson, Montana.

Objectives:

1. To determine the initial and residual

Estimated Allocation of Professional Man-Years by Research Project for Sidney, Montana, for Calendar Year 1967.

Work Project	SWC W6		SWC W7	SWC W13	dSid -4			SWC W15			SWC W18		SWC W20					SWC W21			
CRIS Work Unit	dSid-1		dSid -10	dSid -3	SWC W14			dSid-5			dSid -6		dSid-8					dSid-9			Total
Res. Outline No.	67-3	67-4	67-1	66-2	64-1	63-1	63-2	65-1	66-3	67-7	66-5	67-8	67-9	67-10	62-2	66-1	66-4	67-2	67-5	67-6	
Aase												.35	.30	.20						.15	1.00
Black					.10	.15	.15	.15	.12	.10					.10				.13		1.00
Neff	.72	.28																			1.00
Saulmon			1.00																		1.00
Siddoway				.15	.12						.26		.07			.30	.05			.05	1.00
Wight												.15					.30	.10		.45	1.00
Totals	.72	.28	1.00	.15	.22	.15	.15	.15	.12	.10	.26	.50	.37	.20	.10	.30	.35	.10	.13	.65	6.00

Note: Our estimate of professional man-years for this year and next year is the same as for last year.

effect of P fertilizer on plant growth and the level of sodium bicarbonate soluble P in the soil.

2. To determine if plant responses to fertilizer P can be correlated with, or predicted from, the sodium bicarbonate soluble P level in soils at seeding time.

Mont. S-67-6—Panspots and saline upland range site vegetation: Its ecology, response to contour furrowing, and relationship to the hydrological characteristics of the site.

Location: Panspots and saline upland range sites in southeastern Montana, approximately 15 miles south of Ekalaka, Montana.

Objectives:

1. To study the ecology of vegetation growing on panspots and saline upland range sites.

2. To evaluate contour furrowing as a means of increasing production on panspots and saline upland ranges and to determine the effect of this mechanical treatment on the soil properties and the vegetation.

3. To correlate vegetational and hydrological characteristics of the study sites.

Agricultural Stabilization and Conservation Service

The agricultural conservation program (ACP) is one of the programs administered by the Agricultural Stabilization and Conservation Service (ASCS). ACP provides financial assistance to farmers and ranchers in the form of cost-sharing to install conservation measures on their land. Participation in the program is voluntary. Assistance is offered to protect, improve and renew soil, water, woodland, and wildlife resources. Having adequate vegetative cover on the land also helps to protect the water resource. Listed below are the cost-sharing practices offered in the ACP in Montana which are considered to be directly related to water management.

B-5 — Constructing wells for livestock water.

B-6 — Developing springs or seeps for livestock water.

B-7 — Constructing dams, pits or ponds to provide water for agricultural uses.

B-8 — Installing pipelines and artificial watersheds for livestock water.

C-1 — Establishing sod waterways to dispose of excess water.

C-5 — Constructing diversion terraces, ditches or dikes to intercept runoff and divert excess water to protected outlets.

C-6 — Constructing erosion control, detention or sediment retention dams.

C-7 — Constructing channel lining, drop spillways and similar structures that dispose of excess water.

C-8 — Installing rock riprap, jetties, levees, dikes and other measures to prevent erosion and flood damage to farmland.

C-9 — Constructing permanent open ditches for ground and surface water.

C-10 — Installing underground water control systems for ground and surface water control.

C-11 — Shaping or land grading to permit effective surface drainage.

C-12 — Installing or reorganizing irrigation systems.

C-13 — Leveling land for more efficient use of irrigation water.

C-15 — Lining irrigation ditches to prevent seepage and erosion.

C-16 — Constructing spreader ditches or dikes to spread runoff water on rangeland.

G-2 — Development or restoration of shallow water areas for wildlife.

G-3 — Constructing ponds or dams for wildlife.

G-4 — Fencing of streambanks for the benefit of wildlife and to prevent erosion.

The amount of cost-sharing provided on these conservation measures varies from 50 percent to 80 percent of the average cost.

Funds for ACP cost-sharing to participants and to administer the program are provided annually by Congress. The 1968 ACP allocation to Montana was $4,660,000. This is to cover cost-sharing for all eligible conservation measures, including water resource development and conservation and does not include administrative costs. It is anticipated the 1969 allocation will be about the same as 1968; however, the present economy drive on Federal spending could result in a considerable reduction in ACP funds.

SOIL AND WATER CONSERVATION WORK

Practice	Fiscal Year 1967 Accomplished	Fiscal Year 1967 Paid Out for Materials & Work-Dollars
Seeding Practices		
Land Preparation	72,750 ac.	582,000
Seed	72,750 ac.	400,125
Starter Fertilizer	19,762	114,600
Brush Control	68,185	238,600
Dams		
Diversion	98	392,000
Multipurpose (Shelby)	1	400,000
Multipurpose	18	324,000
Dikes and Levees	26,430 ft.	21,100
Diversion	181,627 ft.	87,180
Drainage		
Field Ditch	387,713 ft.	77,542
Main or Lateral	246,641 ft.	192,380
Farm Ponds	932	1,864,000
Fencing	3,783,816 ft.	568,700
Floodwater Diversion	0 ft.	0
Floodwater Retarding Structure	16	64,000
Floodway	0 ft.	0
Grassed Waterways	538 ac.	45,700
Irrigation		
Canal or Lateral	405,433 ft.	324,346
Ditch and Canal Lining	82,515 ft.	763,264
Field Ditch	905,946 ft.	72,500
Land Leveling	11,321 ac.	724,544
Land Smoothing	2,250 ac.	45,000
Pipeline	324,503 ft.	1,298,000
Storage Dams	14	175,000
Sprinkler Systems	201	703,500
Land Clearing	721 ac.	36,100
Pipeline for Livestock Water	447,117 ft.	178,840
Spring Development	316	205,600
Streambank Protection	105,383 ft.	447,877
Tile Drain	33,492 ft.	51,600
Tree Planting		
Farmstead and Feedlot	303 ac.	9,700
Field Windbreak	326,424 ft.	7,500
Trough and Tanks	775	116,300
Water Control Structures	3,953	790,600
Waterspreading	5,881	379,324
Wells	211	358,700
		12,060,222

It is not feasible to determine the man-years devoted by ASCS employees to water resource development. ASCS employees in all counties administer several programs and the amount of time devoted to each is not tabulated. In addition, only a portion of the time spent on ACP could be charged to the water resources field.

In 1964 a booklet entitled "Water Resource Development in Montana" was prepared by the Montana Technical Action Panel at the request of the Montana State Rural Areas Development Committee. This booklet was published by the Montana Cooperative Extension Service. It lists the research, planning, technical and financial assistance available to communities in water resource development.

Farmers Home Administration

The Farmers Home Administration has been authorized to provide grant assistance to local public bodies to finance comprehensive area plans for water and sewer systems. The minimum area to be included in each comprehensive area plan is the rural area of each county. The purpose of the plans are to promote efficient and orderly development of rural communities and to provide information necessary to avoid overlapping, duplication, underdesign, or overdesign of community water and sewer facilities.

The FHA does not participate in the planning except to advise the local planning agency of the items to be covered in the plan and to provide grant assistance when the planning agency does not have funds available to undertake the plan. At the present time assistance has been provided to city-county planning boards as the planning agencies. Such assistance is being used to prepare plans for Carbon, Jefferson, Richland, Flathead, and Yellowstone counties.

The funds for the comprehensive area plans are directly appropriated by Congress to the FHA which makes administrative allocations to each state. Montana received approximately $18,000 for the fiscal year 1968.

Forest Service

The U.S. Forest Service water-resource activities fall under seven broad categories as follows:

1. Watershed Surveys and Plans
2. Watershed Protection and Management
3. Hydrologic Surveys, Prescriptions and Plans
4. Water Use—Quantity and Quality
5. Soil Surveys, Interpretations and Management
6. Watershed Cooperation
7. Impacts and Liaison — Out-Service Water-Oriented Development Projects

A brief explanation of each of these follows:

1. **Watershed Surveys and Plans**

Objective—Plan for the management of National Forest System watersheds for optimum water yield for National Forest purposes and downstream water uses in accordance with the principles of multiple use and sustained yield.

Included in this program are restoration surveys and plans made on watersheds which are in an unsatisfactory condition and determining what watershed restoration measures will be required to improve the watershed. Also included are flood and other disaster surveys, burned areas surveys, and landslide or avalanche surveys.

In F.Y. 1968 approximately .7 man-years and $9,600 will be expended on these jobs. Two man-years of this work is planned for the 1969-1974 period.

2. **Watershed Protection and Management**

Objective—(a) To retain the soil stability and desirable conditions of water yield in all of the regular management activities, and (b) to repair degraded watersheds in the restoration work and thereby restore the hydrologic balance with a vegetative cover that will prevent erosion, provide soil stability, retard surface runoff, and reduce flood occurrences and damages.

Restoration programs included in this category are, sheet erosion control by pitting, contour furrowing, and/or revegetation of an area. Other restoration measures consist of gully stabilization, streambank and lakeshore stabilization, rehabilitation of abandoned roads and trails, restoration of mining damaged areas, sediment basin construction, and stabilization of blowout and dune areas. Protection includes erosion prevention and control measures to be made an integral part of all road construction contracts, timber sale contracts, special use permits, and easements.

In F.Y. 1968 approximately 2 man-years and $20,000 will be expended on these jobs. About 1,500 man-years of this work is planned for the 1969-1974 period.

3. Hydrologic Surveys, Prescriptions and Plans

Objective—To secure basic data concerning the National Forest water resources and to determine factors influencing its behavior, it is necessary to (a) prepare water yield improvement prescriptions for individual watersheds, (b) provide the necessary information to merge water resource management plans, (c) determine current and long range projections of National Forset use requirements, and (d) fit National Forest water yield improvement programs into overall water resource development programs of other agencies.

The programs include determining the hydrologic condition of the watersheds, securing streamflow measurements, making snow surveys and measurements, securing precipitation and other meteorological measurements, management of barometer watersheds and from the above data, analyze the individual watersheds for specific management prescriptions and determination of current water yields.

In F.Y. 1968 approximately 1 man-year and $11,000 will be expended on these jobs. About 13.5 man-years of this work is planned for the 1969-1974 period.

4. Water Use Quantity and Quality

The quantity objective is to obtain sufficient quantity of water in accordance with legal authority and to provide for the development, use, and management of National Forest resources with due consideration for the needs of other water users.

The quality objective is to obtain, provide, and maintain water of a quality adequate for the management and use of National Forest System resources and return it for downstream use at a quality level which meets downstream user requirements.

Programs include the following:

a. Determination of National Forest present and future water use requirements for the 10 Montana National Forests.

b. Survey of the water use and rights of others on streams originating on National Forest land.

c. Monitoring for complete water quality at two sites within the National Forest.

d. Sedimentation studies on the Gallatin River Drainage.

e. Samplin for turbidity at over 100 stations within the National Forest of Montana.

f. Sampling of drinking water at Forest Service recreation and administrative sites to determine if it meets State Health requirements.

g. Sampling of return flow water below Forest Service waste disposal systems to meet State standards for abatement of pollution.

h. Development of municipal watershed management plans to recognize the water supply values and to provide management which will harmonize present and foreseeable resource use with the domestic supply needs.

i. Plan and develop projects to increase water yield and to improve regulation of streamflow originating on National Forest lands through management of the snowpack by timber harvest cutting practices or snow fencing, type conversion, water spreading, deep percolation, and riparian vegetation management.

In F.Y. 1968 approximately 4.5 man-years and $78,000 will be expended on these jobs. About 1,600 man-years of this work is planned for the 1969-1974 period.

5. Soil Survey, Interpretations and Management

Objective—To measure basic soil data applicable to intensive management of forest and rangeland, to present technical soil information in a readily understandable and usable form for the land manager, and to make the services of skilled and experienced soil scientists available to the resource management personnel for study, advice, and counsel on all soil management problems.

Programs include (a) making standard soil surveys, soil reconnaissance surveys, special soils surveys of problem areas with soil interpretative data and recommendations for the

various resource uses on the soils involved, (b) providing soils management services to all resource managers and engineers, and (c) making soils investigations.

In F.Y. 1968 approximately 7 man-years and $130,000 will be expended on these jobs. About 75 man-years of this work is planned for the 1969-1974 period.

6. Watershed Cooperation

Objective—To cooperate with other public agencies, municipalities, local government units and organized groups in planning and carrying out watershed management and development programs in the public interest where these programs include National Forest lands.

Programs include the following:

a. Preparation of cooperative reports for the Missouri River Basin Inter-Agency Committee and the Pacific Northwest River Basin Commission type I studies and participation in the activities of the U.S. Department of Agriculture Field Advisory Committee in each River Basin.

b. Participate with the Soil Conservation Service and other agencies in the (P.L. 566) Small Watershed Program when National Forest or other forest land is involved in the project watershed.

c. Cooperate with other agencies in emergency flood situations or on other disasters that involve damage to watersheds.

d. Work with State and Federal pollution control Agencies on prevention and abatement of pollution on National Forest Lands.

e. Collect and exchange water measurement data with other agencies.

f. Participate in many other cooperative water resource activities with other agencies, local governments, and water user associations.

In F.Y. 1968 approximately 1.5 man-years and $19,000 will be expended on this cooperative work. About 15 man-years of this work is planned for the 1969-1974 period.

7. Impacts and Liaison—Out-Service Water Oriented Development Projects

Objectives:

a. To ensure coordination of out-Service water-oriented proposals, projects and programs, and to determine if these proposals are compatible with National Forest purposes as set forth in the Multiple Use Sustained Yield Act of 1961.

b. To determine if the proposed use of National Forest System lands and resources could contribute more in public benefit than would other alternatives.

c. To determine the need and justification of the project proposal and for measures to enhance the project proposal and mitigate or offset adverse effects in a manner that will optimize public benefits and reduce adverse effects.

d. To arrive at specific Forest Service actions needed on National Forest System lands to adjust existing plans and uses, and develop new plans and facilities.

e. To inform the proposing agency, or the proponent(s) and other interested persons of the Forest Service findings, conclusions, recommendations and requirements.

f. To secure basic data concerning National Forest water resource and factors influencing its behavior in relation to out-Service-water-oriented proposals.

g. From this basic inventory data, determine specific land management items and measures which are in need of accelerated or increased emphasis in order to attain proposed or existing water-oriented project purposes and by accelerated land treatment measures, improve the capability or life of a proposed or existing water-oriented project.

Program Includes

a. Multiple Use Impact Survey and Report —Includes the development from field surveys of multiple use impact survey reports on proposed construction projects of other agencies, groups, or individuals, for dams, water storage projects and appurtenances connected with water storage projects, such as water transmission lines, electrical power transmission lines, State and Federal highways, National Forest development roads, railroads, and other types of construction which will affect the water resource involved or connected with water-oriented out-

Service proposals on National Forest lands.

b. Provides liaison with the construction agency or individual(s) to ensure that the approved recommendations and practices proposed in the multiple use survey and impact report are translated into action and that National Forest resource needs associated with the project are fully accommodated. Also, that diverse impacts of the project are properly alleviated in relation to water and other resources during the construction phase of the project(s).

c. Hydrological Analysis. Includes hydrological surveys to provide basis for developing a watershed plan of management and formulate prescriptions which will improve water flood and sedimentation, assure the most efficient long-term use of soil and water, establish a more permanent and stable agriculture, and otherwise help to insure the orderly development and prosperity of rural areas.

The program includes activities authorized by several acts of Congress. The principal ones are the Soil Conservation Act (Public Law 46, 74th Cong. 1935), the Omnibus Flood Control Act of 1936 (Public Law 738, 74th Cong. 1936), the Flood Control Act of 1944 (Public Law 534, 78th Cong. 1944) as amended, the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Cong. 1954, as amended), the Great Plains Conservation Act (Public Law 1021, 84th Cong. 1956), and the Food and Agriculture Act of 1962 (Public Law 703, 87th Cong.). Activities under these acts are carried on in cooperation with other Federal agencies and with State and Soil and Water Conservation operations. SCS, under Public Law 46, carries on a broad program of soil and water conservation operations, including direct assistance to farmers and ranchers and technical services to other agencies and organizations.

The primary job of SCS is helping land owners and operators, individually or in groups, practice conservation work on the land. SCS provides this assistance mainly through locally organized soil conservation districts. Such work is basic to, and a necessary foundation for, watershed protection and other soil and water conservation activities in rural areas.

Related activities include soil surveys and soils investigations; helping find and improve plant materials for conservation uses; providing technical services in connection with other USDA programs involving financial or other assistance in conservation quality and water yield through land management practices in connection with out-Service water-oriented projects.

d. Soil Stabilization, Cover Improvement and Related Work. To provide for an action program developed through hydrological survey and analysis for the accelerated land treatment and cover improvement measures needed to improve water quantity, quality, and the general capability or life of the water-oriented resource project and thus attain project purposes in coordination with the Multiple Use Sustained Yield Act of June 12, 1968.

In F.Y. 1968 approximately 5 man-years and $74,000 will be expended on this work. About 104 man-years of these jobs are planned for the 1969-1974 period.

Soil Conservation Service

The Soil Conservation Service is the technical soil and water conservation agency of the U.S. Department of Agriculture (USDA). It is responsible for developing and carrying out a national program of conservation for land and water resources.

The Soil Conservation Service (SCS) administers USDA activities involving technical assistance in soil and water conservation and technical and financial assistance for planning and executing programs to protect and improve water and related land resources in small watersheds. It gives technical information and services needed by other agencies in related programs.

Objectives of the national soil and water conservation program are to achieve land use adjustments and treatment that will conserve land and water resources, reduce the hazards of work; consulting with the Agricultural Research Service and State experiment stations on needed soil and water conservation research; assisting the Extension Service and other educational agencies, institutions, and organizations engaged in soil and water conservation education; and providing technical services and information to agencies responsible for administering conservation work on public lands.

Soils information and small watershed hydrologic information are furnished to governing bodies of municipalities, counties, and community planning and zoning bodies to help guide urban expansion, housing developments, and planning and construction of schools and roads.

SCS assists the soil conservation districts and their cooperating land owners and operators to plan and apply conservation programs. The affairs of each district are directed by an unsalaried local board, the majority of whose members are elected by the people in the district. These districts are legal subdivisions of State Government.

To provide these services, SCS brings together the scientists and technicians needed to solve practical problems of land use and conservation. Its soil conservationists are skilled in coordinating and applying to a particular land area (a farm, ranch, or watershed) the knowledge necessary to conserve soil, water and related resources.

As an integral part of its national program, SCS carries out the Federal part of the National Cooperative Soil Survey. Soil surveys meet the immediate needs of the soil and water conservation program. They also meet other needs for detailed information about soils and land classification. The USDA publishes soil surveys.

Soil surveys are being speeded up to provide land-capability, range-site, and other information for the Great Plains conservation program in critical wind erosion and drought counties. Soils information is being used in rural-areas development as a basis for appraising potentialities of problem areas and of individual farms and ranches and for developing sound conservation farm plans. It also helps municipalities or counties and planning or zoning bodies who guide urban expansion, housing developments, and construction of schools and roads.

Since its beginning in 1899, soil survey work has been done in cooperation with State experiment stations. SCS investigations in soils are cooperative with State colleges.

SCS helps to assemble, screen, and increase plant materials that have possible value in soil and water conservation. In Montana, this work is done at the Bridger Plant Materials Center.

SCS makes and coordinates snow surveys and prepares forecasts of seasonal water supplies in affected streams. This involves direct measurement of snow deposits on selected "snow courses" and the correlation and interpretation of meteorological and streamflow data obtained from other agencies.

In carrying out the snow surveys, SCS has developed working arrangements with a wide variety of Federal, State and local agencies and private concerns according to the circumstances.

The objective is to combine all the available information regarding water supplies from the snow areas into the most economical and useful form possible.

Agricultural Conservation Program. SCS provides technical assistance to the Agricultural Stabilization and Conservation Service (ASCS), especially on the Agricultural Conservation Program, and to farmers and ranchers in the USDA program of cost-sharing for conservation practices of public benefit.

SCS provides technical assistance to the Farmers Home Administration (FHA) in making soil and water conservation loans to farmers and ranchers. These loans are authorized to give adequate financing for soil conservation, water development, water conservation and use, including watershed protection, forestation, drainage, establishing and improving permanent pasture, development of public recreation, fishing and wildlife areas, and other related measures.

SCS cooperates with FHA by reviewing the technical phases of loan applications that concern soils information, engineering design and layout, and other soil and water problems. SCS, upon request, assists loan applicants in preparing plans and designs and supervises the installation of approved practices.

SCS has USDA leadership for the National Inventory of Soil and Water Conservation Needs. The Inventory collects and summarizes information on soil resources, land uses, probable land use adjustments, and soil and water-conservation treatments needed.

The Inventory was completed in 1961 and the National summary of data published in 1962. Various analyses of the data are being made by agencies and groups in and out of government. Periodic surveys wil keep the Inventory up-to-date.

Educational work with farmers and ranchers on soil and water conservation is carried on through the Extension Service as the designated educational agency of USDA.

SCS provides information assistance to educational agencies, institutions, and organizations on subjects and programs relating to soil and water conservation. These services include publications; technical consultation to curriculum specialists, workshop directors, administrators, and others; assistance in training teachers and leaders; and information services to writers, publishers, and other producers of materials for public use.

SCS also cooperates with local and state agencies and other organizations, including State associations of soil conservation districts, in carrying out its information responsibilities as the USDA technical agency in soil and water conservation.

SCS has established procedures for cooperating with other agencies of the Federal Government that administer public land or are otherwise concerned with soil and water conservation. These agencies include:

- U.S. Forest Service
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- U.S. Fish and Wildlife Service
- Bureau of Outdoor Recreation
- Geological Survey
- National Park Service
- Department of Defense

The SCS consults with all these agencies on technical problems of soil and water conservation and assists in various ways agreed upon with each agency.

Watershed protection and flood prevention work combines soil and water conservation on the land with control and use of runoff by means of upstream structures. This work is authorized by the Omnibus Flood Control Act of 1936 (Public Law 738, 74th Cong.), the Flood Control Act of 1944 (Public Law 534, 78th Cong.), and the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Cong. as amended).

SCS helps State and local governments plan and execute the upstream jobs in cooperation with the Forest Service and other Federal, State, and local agencies. The Corps of Engineers, U.S. Army, and the Bureau of Reclamation, Department of Interior, work on the mainstream jobs. SCS correlates its work with that of the Corps of Engineers, Bureau of Reclamation, Fish and Wildlife Service, Bureau of Outdoor Recreation, and other agencies dealing with stream control and other water-resource management.

SCS has administrative leadership for Federal assistance to local organizations for planning and carrying out small watershed projects under the Watershed Protection and Flood Prevention Act.

This Act provides for technical and financial assistance by USDA to State or other local organizations for land treatment, flood prevention, irrigation, drainage, public recreational or fish and wildlife developments, and municipal or industrial water supplies on watersheds up to 250,000 acres in size.

USDA contribution to these projects is of three types:

(1) Technical assistance in planning, designing, and installing works of improvement;

(2) sharing costs of flood prevention and agricultural water management, public recreation or fish and wildlife development; and

(3) extending long-term credit to help local interests with their share of the costs, including costs of developing industrial or municipal water supplies.

These projects are planned for integrated use and conservation of all water and related land resources in a watershed.

Structural measures can be of three kinds:

(1) Flood prevention measures—which are eligible for Federal assistance for the full cost of construction and engineering;

(2) agricultural water management measures, such as drainage and irrigation, or provision of a more uniform supply of water for agricultural use, and public recreation or fish and wildlife developments—which are eligible for Federal technical assistance and cost sharing; and

(3) non-agricultural water management measures such as municipal or industrial water supplies and stream regulation—for which local interests pay the full cost. Loans or advances may be obtained from USDA under certain conditions to help local organizations pay their share of the costs.

Small watershed projects are initiated by local organizations having authority to carry out, operate, and maintain works of improvements under Public Law 566 as amended. Qualified organizations are defined by law and may be a State or any instrumentality thereof. These include soil and water conservation districts, watershed, conservancy, drainage, irrigation or other special purpose districts, water users' associations, municipalities, and similar organizations not operated for profit.

The local organization makes an application for assistance to the Secretary of Agriculture. This application is first submitted to the State Soil Conservation Committee. As a matter of policy, no application will be acted upon by the USDA until it has the approval of the designated State agency. As of July

1, 1968, fifty-two applications for assistance have been approved in Montana.

Construction has been completed on four projects They are: Lower Willow Creek Watershed Project, Box Elder Creek Watershed Project, Jawbone Creek Watershed Project and City of Shelby Watershed Project.

Planning authorization has been granted on eighteen projects. In addition to those listed above, they are: Antelope Creek, Beaver Creek, Big Spring Creek, Boulder River, Brown's Gulch, Cottonwood Creek, Flathead Creek, Hysham Bench, Pondera Creek, Sidney Water Users' Association, Three Mile Creek, Valley Creek and Whitehall.

All work is carried out by the local sponsoring organizations. The Federal Government supplies only technical and financial assistance. Construction, operation, and maintenance are the responsibility of the local agency. It is the policy of USDA and SCS to cooperate with local, State, and other Federal agencies concerned with water and related land resource development to achieve a coordinated effort.

SCS also participates with other Federal and State agencies in making surveys and investigations of river basins and other watersheds. These studies provide the basis for developing coordinated programs for the orderly development, management, and use of water and related land resources of the basins, or are concerned with special water problems in certain basins.

SCS has overall responsibility for USDA participation in these activities and heads advisory committees in Washington, D.C., and at field locations to coordinate the participation of USDA agencies. SCS, Forest Service, and Economic Research Service take part in the surveys and are represented on the committees.

The Great Plains conservation program, authorized by Public Law 1021, 84th Cong., is designed to help farmers and ranchers in the Great Plains to make the land use adjustments and plan and install the soil and water conservation measures needed to achieve a more stable agriculture. A major objective is to convert to grass land unsuited for cultivated crops. SCS has the administrative leadership of the program.

Soil and water conservation activities of SCS for many years have contributed to the development of rural areas and increased economic opportunities in rural America. New authorities and tools provided in the Food and Agriculture Act of 1962 enable the USDA to accelerate assistance toward the major objective of rural areas development.

The Act provided new authorities or expanded established ones for the following activities:

1. SCS has administrative responsibility for USDA activities in resource conservation and development projects approved under Section 102 of the Food and Agriculture Act of 1962 (Public Law 87-703).

   These projects are designed to speed up conservation activities in areas of sufficient size that they will have significant impact on the local economy. They usually consist of parts or all of several counties.

   Local people must initiate and sponsor the projects through legally constituted local organizations. All agencies of USDA may cooperate in assisting local sponsors plan and carry out accelerated programs of conservation, development, and use of all land, water, and related resources in the area.

   The Bitter Root Resource Conservation and Development Project was approved November 10, 1965. Applications have been submitted by the Beaverhead, Beartooth and Headwaters Areas.

2. SCS had leadership responsibility in USDA assistance to landowners in developing income-producing recreation enterprises on rural land. It also gives technical and financial help to sponsors of public recreation areas as part of a watershed protection program. It acts as liaison with other Federal agencies who may give technical, credit, or cost-sharing help.

During the 1968 fiscal year, we will have used $2,041,000 from SCS appropriated Federal funds and $300,500 reimbursable funds from ACP and others for a total of approximately $2,341,500 for SCS operations in all programs outlined above.

The man-years used on all programs were 247 from SCS appropriated funds, and 42 from reimbursable funds for a total of 289 man-years for the 1968 fiscal year.

DEPARTMENT OF THE ARMY

Corps of Engineers, Seattle District

Libby Dam

Descriptions of the Libby Dam constructed in Montana and the man-years of work for Libby Dam construction are estimated as follows:

Calendar Years	Man Years
1968	1,800
1969	2,200
1970	2,100
1971	1,800
1972	900
1973	200

Libby Dam construction and the Clark Fork-Flathead River Basin Study are funded by specific appropriations from Congress. Studies and projects under Section 205 of the 1948 Flood Control Act are funded from blanket appropriations for the 205 program. The funding status of Department studies is indicated on the descriptions below, for Libby Dam. The total estimated cost is shown as $360,000,000; appropriations through Fiscal Year 1968 (June 1968) total $98,000,000. Estimated expenditures for F.Y. 1968 are $54,300,000 and for F.Y. 1969 are $51,000,000.

The pamphlet "Water Resources Development in Montana," dated January 1967, and issued to State of Montana offices by the Department of the Army, Missouri River Division, Corps of Engineers, Omaha, Nebraska, provides a good summary of completed projects and descriptions of our continuing authority and survey programs. However, the following descriptions contain more current information on individual studies and Libby Dam.

Clark Fork and Flathead River Basins

Flood Control

Authorizations: Resolutions of the U.S. Senate and House of Representatives Public Works Committees, dated 28 July and 3 September 1964, respectively.

Description: The Clark Fork-Flathead River Basins, including the Pend Oreille River Basin, cover an area of approximately 26,000 square miles in western Montana, northern Idaho, northeastern Washington, and southern British Columbia. The primary study area lies upstream from Pend Oreille covered with standing timber. There is some agricultural development in the valleys.

Proposed Improvements: The study will investigate the feasibility of local flood protection projects and storage for flood control, power, irrigation, low-flow augmentation, and other related water resource uses. Projects under consideration include levees along the Flathead River in the vicinity of Kalispell and Columbia Falls, enlargement of the outlet to Flathead Lake, lowering the outlet to Swan Lake, and the projects listed in the memorandum report to the FPC which are worthy of further investigation.

Status: Public hearings were held at Missoula and Kalispell, Montana, on 10 and 11 May 1966. The study is in its third year. The primary effort to date has been the review of storage sites as described in H.D. 403, 87th Congress, 2nd Session. A memorandum report covering 15 projects in the basin has been provided the Federal Power Commission for use in consideration of a license request by Montana Power Company for construction of hydropower projects at Buffalo Rapids sites No. 2 and No. 4 on the Flathead River.

Funding Data:

Appropriations thru FY 1968	$155,000
Authorized study cost	450,000
FY 1968 expenditure	65,000
FY 1969 estimate	32,000

Schedule: Study will be completed about FY 1971.

Clark Fork—Orchard Homes

Continuing Authority—Section 205

Description: By letter dated 19 November 1964, the Missoula County Commissioners requested Federal assistance in eliminating the flood threat to Orchard Homes, an unincorporated community on the left bank of the Clark Fork River, about one mile downstream from Missoula, Montana. The upper end of Orchard Homes is protected by a levee built by the Corps of Engineers in 1948. This levee is not tied into high ground on the lower end, and as a result during flood stages of the Clark Fork, water flows around the lower end of the levee. Preliminary analysis indicated that there was sufficient possibility of flood threat to the remainder of the Orchard Homes area to warrant more detailed studies.

Proposed Improvements: None. Project is economically infeasible.

Status: An unfavorable report was submitted to the Division Engineer at Portland, Oregon, on 19

June 1968. Study is complete. F.Y. expenditure was $33,500.

Blackfoot River Near Lincoln, Montana

Continuing Authority—Section 205

Description: In the summer of 1964, several residents of the unincorporated town of Lincoln, Montana, through their congressional representative, requested a study of the flood problem there, caused by the Blackfoot River. During high stages the Blackfoot River overflows its banks about five miles upstream from the town into an old river channel occupied in part by the Grosfield irrigation canal and State Highway No. 20. The flood waters flow down the irrigation canal and along both sides of the state highway into the town of Lincoln, inundating large suburban and urban areas.

Proposed Improvements: Remedial measures would consist of a levee about 3,500 feet long, across the head of the old river channel, to prevent flood waters from entering the old channel.

Status: Draft of detailed project report was submitted to North Pacific Division on 16 May 1967 and forwarded to OCE 28 June 1967. The Commissioners of Lewis and Clark County have furnished assurances of local cooperation. On 29 March 1968 the Governor of Montana was furnished a copy of the plans of the proposed improvement, and his endorsement was requested. By letter dated 12 June 1968, the Governor stated, "I assume that my endorsement is not needed, since it appears that the county commissioners are not now willing to proceed."

Funding: Study funding is complete. No. F.Y. 1968 expenditure. F.Y. 1969 expenditure estimated at $40,000.

Cottonwood Creek—Deer Lodge, Montana

Continuing Authority—Section 205

Description: By letter dated 24 May 1967, the Mayor of Deer Lodge requested that the Corps of Engineers eliminate the flood threat to Deer Lodge from Cottonwood Creek. The creek flows through the principal residential and business districts of Deer Lodge and discharges into the Clark Fork near the westerly edge of the city. In June 1964 a severe flood occurred, damaging residences, schools, business establishments, streets, roads and utilities.

Proposed Improvements: Remedial measures would consist of diverting a part of the flow of Cottonwood Creek, near the upstream edge of the city, into adjoining area lying north of the city, thence into the Clark Fork by way of Johnson Creek. The project would involve the construction of a concrete diversion structure, about 3,000 feet of unlined channel and possibly some culverts. Other alternatives will also be considered during the detailed study.

Status: A brief reconnaissance report is being prepared based on data available in the District office. First draft of the report is essentially complete. A letter of intent has been received from city officials agreeing to sponsor the project.

Funding: Study funding is complete. No. F.Y. 1968 expenditure. F.Y. 1969 expenditure estimated at $21,500.

Clark Fork River Flood Plain

Flood Plain Information Study

Authorization: Section 206, P.L. 88-645, Flood Control Act of 1960, as amended, authorizes the compilation and dissemination of information on floods and potential flood damages. The Clark Fork River Flood Plain Information Reports are being prepared in compliance with this authority.

Description: The study limits include the following river reaches:

a. Clark Fork—one mile above Missoula to the mouth of the Bitterroot River.

b. Flathead River—Columbia Falls to city of Kalispell.

c. Whitefish River—mouth upstream to town of Whitefish.

d. Bitterroot River—mouth upstream to Hamilton.

Proposed Study Program: The study will determine the extent and frequency of flooding within the above limits. Separate reports will be prepared for each area and distributed to the public, containing such items as records of past floods, photographs and maps showing previous flood limits and limits to be expected for larger floods, profiles, and cross-sections of flood levels, and suggestions on how to minimize damages.

Status: The Report for Missoula Section (a) was completed in November 1967 and presented to local officials on 12 January 1968. Work on Section (b) started 1 July 1967 and is expected to be completed in FY 1969 depending on availability of funds. Funds

to continue and complete studies on the Whitefish and Bitterroot Rivers will be requested in FY 1970 and 1971.

Funding Data: Total Study:

Estimated Federal Cost	$215,000
Allowance to Date	34,800
Balance to Complete	180,200
Available for Obligation FY 1968	5,000
No estimate for FY 1969	.....

Planning funds for the Columbia-North Pacific Study (Montana part) are estimated to be about $90,000 for FY 1968.

Corps of Engineers, Omaha District

Following are brief summaries of the current Corps of Engineers work in that portion of Montana east of the Continental Divide. Information pertaining to Corps work in Montana west of the Continental Divide may be obtained from the District Engineer, Seattle District, 1519 Alaskan Way South, Seattle, Washington 98134.

The total estimated costs for the conduct of studies, the development of plans for projects, the operation and maintenance of projects, and the Construction of projects within the State of Montana by the Omaha District, Corps of Engineers for Fiscal Year 1968 are $3,265,500. Provided that funds are made available, the total estimated costs of our programs in the state during Fiscal Year 1969 are $3,104,500.

Summary of Omaha District Programs in Montana

Authorized Projects:

Sun River at Great Falls, Montana. This project was authorized by the 1958 Flood Control Act. The estimated costs are $4,920,000 Federal and $1,136,000 non-Federal. A contract in the amout of $947,100 for the initial construction of the project is scheduled to be under way in the late summer of 1968. Additional funds have been programmed for this project which is scheduled for completion in 1970.

Yellowstone River at Billings, Montana. This project was authorized by Section 204 of the 1950 Flood Control Act. The estimated costs, as of 1965, are $5,000,000 Federal and $400,000 non-Federal. Funds are available for the conduct of a feasibility study of the Western Unit of the project. The re-study of this project is held in abeyance, pending receipt of additional information from local authorities.

Yellowstone River at Miles City, Montana. This project was authorized by the 1950 Flood Control Act. The estimated costs, as of 1960, are $1,650,000 Federal and $55,000 non-Federal. Due to lack of local support this project is inactive.

Sun River at Vaughn, Montana. This project was authorized under Section 205 of the 1948 Flood Control Act as modified by subsequent legislation, including Public Law 874, 87th Congress. Construction of this project was initiated in June 1968 at an estimated cost of $393,000 Federal and $16,500 non-Federal.

Authorized Basin Studies:

Sun River and Tributaries. This study was authorized by the Senate Public Works Committee resolution adopted 11 June 1964. The study was initiated in January 1966 to investigate the feasibility of developing additional projects for the control of flood and erosion damage and for the enhancement of the existing water resources of the basin. The study was completed in August 1967. It was determined that construction of the authorized projects at Great Falls and Vaughn will essentially eliminate the major urban flood damages in the basin. A potential future plan for basin development was evolved and found to be economically infeasible at this time.

Marias River. This study was authorized by the Senate Public Works Committee resolution adopted 11 June 1964. The study was initiated in January 1966 and is directed toward the development of multi-purpose storage reservoirs to provide flood control, bank erosion control, recreation, municipal and industrial water supply in the basin. The study is scheduled for completion in 1971.

Three Forks Basin. This study was authorized by the Senate Public Works Committee resolution adopted 29 July 1949. The study was initiated in November 1966 and will be directed primarily toward the development of flood and erosion control projects with consideration being given to recreation, and fish and wildlife needs. The study is scheduled for completion in 1971.

Missouri River Basin above Fort Peck. This study was authorized by the Senate Public Works Committee resolution adopted 8 March 1960. This study was initiated to determine the advisability of development projects in this reach of the Missouri River in the interest of flood control, hydroelectric power, conservation and related purposes. A report was

submitted in 1963 recommending the construction of a dam and reservoir on the Missouri River near the town of Fort Benton, Montana and a dam and reservoir on the Missouri River immediately upstream of Cow Creek. The estimated Federal costs are $340,-343,000. The report is being reviewed by the Secretary of the Army.

Local Flood Control Studies under Section 205 of the 1948 Flood Control Act:

Livingston, Montana. The County Fairgrounds and a new high school in Livingston are subject to flooding from the Yellowstone River. The total estimated costs are $1,095,000. A detailed project report is scheduled for completion in January 1970.

Malta, Montana. The northern part of the city of Malta is subject to flooding from the Milk River. The total estimated costs are $180,000. A detailed project report is scheduled for completion in January 1969.

Nashua, Montana. The low-lying residential area of Nashua and the sanitation lagoon are subject to flooding from the Milk River and Porcupine Creek. A preliminary study to determine the feasibility of providing the needed flood control protection is tentatively scheduled for completion in January 1969.

Roundup, Montana. The city of Roundup is subject to flooding from the Musselshell River. The total estimated costs are $408,000. A detailed project report is scheduled for completion in May 1970.

Three Forks, Montana. The city of Three Forks is subject to flooding from the Jefferson River. A detailed project report may be authorized for completion at a later date.

Construction at Fort Peck Dam and Reservoir. A project consisting of forty-eight houses and a shopping center was authorized for construction at Fort Peck, Montana. Construction of this project was initiated in May 1967 and it is scheduled to be completed in July 1969. The total estimated costs are $1,600,000.

A project consisting of 21 miles of access road to the Hells Creek State Park in Montana was authorized for consiruction. Construction of the project is to be initiated in July 1968 and it is scheduled to be completed in July 1969. The total estimated costs are $230,000.

A project consisting of the painting of the penstocks and surge tanks at Fort Peck Dam was authorized. The painting on this project was initiated in March 1968 and it is scheduled to be completed in August 1968. The total estimated costs are $160,000.

DEPARTMENT OF COMMERCE

Environmental Science Services Administration

Weather Bureau

This brief summary will be restricted to the ESSA climatological and hydrologic effort in collecting and recording basic climatic information—including but not restricted to precipitation in its several forms.

The Weather Bureau maintains a network of 288 full climatological (temperature and precipitation) stations, plus about 100 equipped with recording precipitation gages primarily for hydrologic purposes. The task includes publication of the data obtained, plus some analysis and application thereof, including precipitation probabilities, frequency, depth-duration, etc., studies. The funding source, as far as activity is concerned, is ESSA, although certain parts of the U.S. Weather Bureau station network are supported by Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration. A rough estimate of the total for all phases of this program including all costs is about $90,000 annually (salaries, maintenance, equipment, publication of data, etc.).

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

The Department of Health, Education, and Welfare's responsibility in the field of water resources for the State of Montana is related to the following five major fields of activity.

1. Under the Federal Quarantine Regulations HEW is charged with the evaluation of the suitability of supplies to provide potable water to interstate carriers. In this activity the Department works closely with the Montana State Department of Health's sanitary engineers in field surveys of domestic water supply systems from the source of the water to the consumers' tap. Normal procedure is to make a joint survey of each supply with the State about once every three years, and a desk review is made of the system's records the remaining years.

Presently, HEW has ten supplies in this category, with an estimated work load of about six man-years per year.

2. Consultation is provided on a request basis to the State Department of Health on matters pertain-

ing to domestic water supply. This consultation may involve such items as pesticides, bacteriological and chemical quality, training, and other related water matters. As is readily apparent, this work load may vary from year to year from a minimal amount to many man-weeks of time.

3. This Department is charged with the Health Factors of Water Pollution. Working closely with the Department of Interior's Federal Water Pollution Control Administration, HEW provides consultation on matters of pollution in Montana.

4. The Department is a participant in the Type I Studies now underway, which include Montana in the Missouri River Basin Study and the Pacific Northwest River Basins Commission. A considerable portion of the work on the Missouri River Basin is carried out by our Kansas City Regional Office, while we and our San Francisco Office are active in the Pacific Basins Study.

5. The Department of Health, Education and Welfare reviews water related reports prepared by other Governmental entities, such as the Corps of Engineers, Bureau of Reclamation, and Soil Conservation Service for items of health significance. A close liaison is maintained with these agencies, and the Department's recommendations are usually incorporated in their reports.

With the recent addition of a water resource engineer, the Department stands ready to assist Montana when needed. However, as this Region includes Colorado, Idaho, Montana, Utah, and Wyoming, service to Montana may be limited on occasion as the Department has only two engineers on the staff of the Water Supply and Sea Resources Program. Based on the staff and the Region served, HEW can normally devote 0.4 man-years to water resources in Montana.

DEPARTMENT OF THE INTERIOR

Bonneville Power Administration

Bonneville's primary role is the transmission and sale of power from the Federal projects of the Pacific Northwest. In addition, Bonneville is the primary agent for wheeling electric power generated by public and private utilities in the area, is responsible for major power contracts with the Pacific Southwest utilities, is a part of the United States Entity administering the Columbia River Treaty projects and is involved in the water management of many streams. Because of these responsibilities and activities, the Administration has, alone or in cooperation with Federal agencies or other groups, supported studies and programs to better utilize water resources of the Pacific Northwest.

Because of the difficulty of supplying a definitive total budget figure relating these programs to predecessor programs, Bonneville would rather omit this item. The following water resource projects are currently supported by Bonneville in Montana:

I. (a) Project Title: Hungry Horse Hydrology Studies.

(b) Principal Investigator: M. I. Rorabaugh, W. D. Simons, U.S. Geological Survey Project Engineers, Menlo Park, California.

(c) Research Field: iEvaporation losses computed by the energy-budget method. Ground-water outflow and bank storage; surface flow runoff; water temperature studies.

(d) Date of Initiation: May 26, 1964.

(e) Probable Completion Date: July 1969.

(f) Sponsor: Bonneville Power Administration in cooperation with the U.S. Geological Survey.

(g) Annual Budget: (1969) $5,000.

(h) Project Description: The basic objective is to determine accurately the volume of water available to Hungry Horse Reservoir and to improve forecasting procedure. Related to this is the apparent imbalance between inflow and outflow, evaporation, precipitation, ground-water levels and their effects, bank storage, and the accuracy of and the ability to assess the variables involved.

(i) List of Publications of Project: Open File Report: Hydrology of Hungry Horse Reservoir, Montana—Basic Data Supplement, dated March 1968.

II. (a) Project Title: Cloud Seeding—Hungry Horse Reservoir Drainage.

(b) Principal Investigator: U.S. Bureau of Reclamation; North American Weather Consultants, Goleta, California.

(c) Research Field: Weather modification by cloud seeding techniques.

(d) Date of Initiation: December 1966.

(e) Probable Completion Date: June 1975.

(f) Sponsor: Bonneville Power Administration and Bureau of Reclamation.

(g) Annual Budget: (1969) $100,000.

(h) Project Description: The object of this project has been to apply existing weather modification techniques in the drainage basin above Hungry Horse Dam to aid in the determination of the feasibility of increasing water supplies by current cloud seeding methods.

(i) List of Publication on Project: "Performance of the Atmospheric Water Resources Research Program in the Hungry Horse Area, Montana, 1966-1967 Season."

III. (a) Project Title: Libby Hydrology Studies.

(b) Principal Investigator: W. D. Simons, U.S. Geological Survey, Project Engineer, Menlo Park, California.

(c) Research Field: Ground-water losses, bank storage potential; accurate logging of stream inflow and outflow and accurate determination of storage when reservoir is filled.

(d) Date of Initiation: July 1968.

(e) Probable Completion Date: June 1974.

(f) Sponsor: Bonneville Power Administration and U.S. Corps of Engineers.

(g) Annual Budget: (1969) $20,000.

(h) Project Description: Preliminary investigations indicated this reservoir basin contains many bank areas which would store water. There are several dams directly south of this area in similar basins that have experienced large groundwater losses. We need to know the potential for groundwater storage and possibilities of subsurface outflows. Accurate knowledge regarding the inflows and outflows prior to and during reservoir filling is essential.

(i) List of Publications on Project: None.

IV. (a) Project Title: Airborne Radiometric Snow Survey.

(b) Principal Investigator: Montana State University.

(c) Research Field: Hydro-Meteorology.

(d) Date of Initiation: July 1961.

(e) Probable Completion Date: June 1969.

(f) Sponsor: Bonneville Power Administration and Atomic Energy Commission.

(g) Annual Budget: (1969) $20.000.

(h) Project Description: Design and fabricate an operationally reliable system of measuring snow water contents from an aircraft by measuring the degree of attenuation of gamma radiation from a radioactive source of known strength preplaced under the snowpack.

(i) List of Publications on Projects: Progress Report: Report on Airborne Radiometric Snow Survey System by Engineering Research Laboratories, Montana State University, Bozeman, Montana, dated 1966.

V. (a) Project Title: Snow Sensor—Telemetering.

(b) Principal Investigator: Montana State University, Electronic Research Laboratory.

(c) Research Field: Electronic digitizing equipment for reporting amounts of snow water.

(d) Date of Initiation: July 1966.

(e) Probable Completion Date: July 1968.

(f) Sponsor: Bonneville Power Administration.

(g) Annual Budget: None.*

(h) Project Description: This program is to study methods and devices to find the best means of converting liquid pressure from a snow pillow to an electronically digitized signal that can be transmitted from a remote site to a central station.

(i) List of Publications: None.

*Funds provided in Fiscal Year 1968 are used to meet completion date which was extended one month.

VI. (a) Project Title: Reservoir Bank Storage in the Columbia River Basin.

(b) Principal Investigator: W. D. Simons, U.S. Geological Survey, Project Engineer, Menlo Park, California.

(c) Research Field: Ground-water outflow

and bank storage; surface flow runoff—available water for generation.

(d) Date of Initiation: July 1966.

(e) Probable Completion Date: June 1973.

(f) Sponsor: Bonneville Power Administration.

(g) Current Program Cost: $3,500.

(h) Project Description: Preliminary studies indicate that failure to balance reservoir inflows with outflows, allowing for changes in content of reservoir and evaporation losses, was caused by bank storage equal to or exceeding three percent of reservoir volume. More accurate knowledge of bank storage characteristics or total available water storage is necessary to prevent loss of generation revenues to downstream projects.

(i) List of Publications on Project: None.

VII. (a) Project Title: Relationship of Ground-Water Storage and Streamflow, Columbia River Basin.

(b) Principal Investigator: M. I. Rorabaugh, W. D. Simons, U.S. Geological Survey, Project Engineers, Menlo Park, California.

(c) Research Field: Surface water hydrology and ground-water contribution to streamflow.

(d) Date of Initiation: January 24, 1958; Renewed 1969.

(e) Probable Completion Date: Continuing Program.

(f) Sponsor: Bonneville Power Administration.

(g) Annual Budget: (1969) $23,400.

(h) Project Description: The objective is to determine the importance of the ground-water component of flow during low water periods; and, if the ground-water component is determined to be significant, to devise an operational forecasting procedure whereby the ground-water component, either alone or as a parameter to suplement other methods, may be used to improve the reliability of forecasts during low water periods.

(i) List of Publications on Project: "Estimated Changes in Bank Storage and Ground-Water Contribution to Streamflow"—paper given at meeting of International Union of Geodesy and Geophysics, Berkeley, California — August 1963; and No. 63 of I.A.S.H. Symposium of Surface Waters, pp. 432-441. Open File Report — two phases — "Exploration of Methods of Relating Ground Water to Surface Water, Columbia River Basin."

VIII. (a) Project Title: Operational Hydromet Data Management System.

(b) Principal Investigator: North American-Rockwell Corporation, Jim Schiefer, Task Force Representative, Downey, California.

(c) Research Field: Program planning: development of concepts; logging of data needs; facilities and modes of hydromet data sensing, transmission, and handling.

(d) Date of Initiation: Phase II — August 1967.

(e) Probable Completion Date: June 1976.

(f) Sponsor: Bonneville Power Administration.

(g) Annual Budget: (1969) $16,600.

(h) Project Description: The objective of this project is to obtain technical assistance in the orderly development of automation of the Federal multipurpose power system operation in the Pacific Northwest. The area pertinent to hydrology is to develop a plan for a Joint Pacific Northwest Federal Agencies Data Management system for collecting, transmitting, storing, retrieving, processing and displaying hydrometeorological data.

(i) List of Publications: None.

Bureau of Indian Affairs

Billings Area Office

The irigation program on the Indian reservations, has until recent years been the principal plan for water utilization. There has developed meanwhile some planning for recreation, fish and wildlife, as well as municipal industrial and domestic use. There has also been a limited use in the development for range benefit, stock water ponds, and

conservation practices for prevention of land erosion. The amount of water deployed by these practices is not large but is increasing.

Principal Indian Irrigation Projects include the Flathead and Fort Peck projects which have been approved and the Crow, Fort Belknap, and Blackfeet Projects which are pending final approval.

Reports prepared by the Missouri River Basin Investigation outline potential areas which may warrant future development. These reports are part of the Comprehensive Report for the Missouri River Program.

Stock water development is dependent upon ASC assistance funds and the desire of landowners to make developments. Tribal interest in this development is increasing and the Tribes are supplying some funds and equipment, in addition to that supplied by ASC. The Bureau is working continually with interested parties. There are several locations on all reservations which have been studied or are planned for study in order to derive maximum benefits from this approach.

Plans for irrigation on the Rocky Boy Reservation are associated with the Bureau of Reclamation's plan for using the water of the Tiber Reservoir. An improvement lease has been made for developing 598 acres by utilizing water from Bonneau Reservoir on Box Elder Creek. The lease covers lands east and northeast of the community of Box Elder.

Plans for the Northern Cheyenne Reservation are directed toward the utilization of Tongue River and Rosebud River. The Tongue River water, while originally planned to be used for irrigation, is now being considered for industrial development, and as an accessory to the development of other mineral resources of that area.

Fort Peck Agency

Programs involving water resources on the Fort Peck Indian Reservation include:

Fort Peck Irrigation Project

Presently serving 15,000 acres. Expansion will provide facilities for a total of 25,000 acres by Fiscal Year 1971. Funding is through a reimbursable appropriation.

Ponds

Approximately nine impoundments constructed annually with an average surface area of five acres. Funding is by private and Federal A.C.P. funds. Average structure cost equals $1,100.00.

Drainage

Approximately 320 acres drained annually. Funding is through private and Federal A.C.P. funds.

A total of $30,000 in Federal A.C.P. funds were expended on Trust lands in the water resources field. The cost to the operator was approximately $30,000, also a total of $60,000 expended. The practices involved and units completed are as follows:

Conduits and drops	25 each
dikes	12,800 cu. yds.
leveling	275 acres
upland water wasteways	19 acres
water distribution	280 acres
water spreading	160 acres

We expect our program to continue at this rate for the planned future.

Flathead Agency

The waters of the Flathead are used extensively for irrigation on the 125,000+ acre Flathead Indian Irrigation Project. Ways and means are being explored by the water users and the Bureau of Indian Affairs to increase storage facilities to more adequately serve present needs and allow for some expansion to potentially irrigable lands.

Water is used for generation of electrical energy through Montana Power Company's Kerr Dam. Studies are continuing by the Bureau of Reclamation, Corps of Engineers and Bureau of Sports Fisheries and Wildlife for the development of other such sites within the Reservation boundaries.

The United States Geological Survey has just been granted permission to do an extensive water study on the reservation over the next three to four year period. This study will include both surface and underground water resources and their potentials.

The Tribes just recently received an E.D.A. Title III planning and administrative grant-in-aid to evaluate economic development alternatives that exist in the area. Water will be of paramount importance in these evaluations since hydroelectric power generation and commercial outdoor recreation are two of the most promising economic development areas.

Bureau of Land Management

The Bureau of Land Management's total program in Montana including the soil and watershed programs, is directed from the State Office in Billings and six District Offices. District offices are located in Malta, Miles City, Billings, Dillon, Lewistown, and Missoula. Some 8.5 million acres of public lands are administered from these offices.

The Bureau's soil and watershed program for public domain lands includes evaluation of watershed conditions and the installation and maintenance of watershed treatment practices to retard erosion and reduce peak discharges. Among treatments commonly used are detention dams, contour furrowing, and development of increased vegetative cover through management of surface use.

Objectives of the program include (1) the enhancement of off-site values and water quality by reducing sediment runoff, flood damage and siltation, regulating streamflow, and replenishing underground water supplies, and (2) the enhancement of on-site values by restoring and protecting soil resources for current and future use.

One of the most immediate objectives and pressing problems is to increase the ability to measure, in quantifiable terms, such things as soil loss, water quality, groundwater recharge, and flood damage and siltation as a basis for evaluating the many alternative watershed protection and improvement practices.

During the current fiscal year, the soil and watershed program includes the following:

1.	Watershed survey	1,900,000 acres
2.	Watershed planning	410,000 acres
3.	Brush control	17,000 acres
4.	Fencing	127 miles
5.	Seeding	1,700 acres
6.	Contouring and Interseeding	900 acres
7.	Reservoirs	153 each
8.	Detention Dams	238,000 cu. yds.
9.	Diversion dams	13,600 cu. yds.
10.	Dikes	10,500 cu. yds.
11.	Silt checks	10,000 cu. yds.

In addition, maintenance is being conducted on established projects. A total of $907,000 has been allocated for this program in Montana for fiscal year 1968, all of which is appropriated by the Congress. It is estimated a total of 35 man-years will have been devoted to the Montana soil and watershed program during FY 1968.

In the years previous to FY 1968, the Bureau's program has exhibited approximately the same balance among treatment measures. Of course, future year's appropriations are indefinite, therefore, the precise amount of work to be undertaken is uncertain. Anticipated, however, is some shift in emphasis away from large structures. Emphasis will be shifted toward management practices without artificial treatments, such as reseeding. This will increase the number of small stockwater reservoirs to implment intensive management systems. Total water storage however, would probably decrease from that stored behind large compacted fill detention structures.

Bureau of Mines

Denver Office of Mineral Resources

Mineral industry water requirements are expected to increase five fold within the next 50 years. Thus, the water-related program of the Bureau of Mines in Montana and other Missouri River Basin States is directed to basic and complementary needs: (1) that of the Basin States for further industrial growth: (2) that of the mineral industry for adequate supplies of water; and (3) that of the construction agencies for specific data required for planning purposes.

Work units in progress or scheduled for the immediate future in Montana, budgeted annually at about $25,000 and requiring about 2 man-years of time, include:

Comprehensive Study of Missouri River Basin.—A State-Federal comprehensive framework planning study is nearing completion. The Bureau of Mines segment of the effort has included an economic base study of existing mineral industry and projections of future production and employment, conversion of such projections into estimates of land and water requirements for mineral development, and assistance in formulating a coordinated plan for utilization of all major resources.

Water-Related Mineral Resource Studies of Subbasins.—A mineral resource development study is nearing completion in the Three Forks Division, and another is scheduled in the Yellowstone Basin of Montana. Parallel resource economics studies, pertinent both to Montana and adjacent States, are being made in the Tongue River and Little Missouri River Basins.

Mining, Processing, and Using Solid Fuels.—Specific information on the location, grade, and

minability of large blocks of coal and lignite near assured water supplies often is lacking. To fill this gap, a series of Statewide reports is in preparation on stripping coals of Montana, Wyoming, and North Dakota. The reports, now in their final stages, will be issued in that order. A related study is being completed of the impact of a coal conversion plant on selected communities of Wyoming and Montana.

Impact of Water Development on Mineral Industries of Basin.—An economic study recently was undertaken to identify and evaluate significant secondary benefits of water development projects as they pertain to mineral and allied industry in the Missouri Basin. Objectives are to ascertain just what the Missouri River Basin Project has meant to the mineral industries in terms of new markets, gross sales, employment, water and power supply, and water-borne transport.

Mineral Examinations of Reservoir Sites.—Mineral examinations normally are made of reservoir sites proposed by the Bureau of Reclamation and the Corps of Engineers. The reconnaissance examinations are made, preferably as early as possible during project investigations, to evaluate and weigh benefits to the mineral industry, such as an assured water supply, against damages, such as inundation of resources. Following analysis of the facts, specific recommendations are made to the construction agency that attempt to present the best possible balance between conservation and development of resources.

Albany Office

The Bureau of Mines has described instances of water usage in the Montana mineral industries in its Information Circular (IC) 8305 entitled "Water Requirements and Uses In Montana Mineral Industries," published 1966, 103 pages. The Montana Study, giving pertinent data on water use and needs of the mineral industry, is intended to adequately inform other agencies and industry concerned with water conservation, development, construction, and planning, so that needs for water by the mineral industry are adequately considered.

Water-use practices at mineral processing operations are described in the report, and each description is based on a schematic waterflow diagram. The 27 operations described include 9 in the metals category and 11 in the nonmetals group, as well as 1 coal and 6 petroleum refining operations.

Bureau of Outdoor Recreation

Mid-Continent Region

The Bureau of Outdoor Recreation conducted a recreation-oriented study of the middle Missouri River from Yankton, South Dakota to Fort Benton, Montana. The authority for this study was a Senate Committee on Interior and Insular Affairs resolution adopted on February 17, 1966. The field phase of this study was conducted by the Bureau's Mid-Continent and Pacific Northwest Regional Offices. A report on the Bureau's findings and recommendations was released on June 18, 1968, and is entitled, "The Middle Missouri . . . A Rediscovery." One of the major recommendations contained in the report refers to the establishment of a Missouri Breaks National River extending from Coal Banks Landing, Montana to the western boundary of the Charles M. Russell National Wildlife Range, Montana.

The Missouri River Basin Comprehensive Framework Study, which is to be completed by 1970, is a direct result of President John F. Kennedy's Special Message to Congress on Natural Resources in February 1961, and subsequent Congressional action. Ten Basin States and seven Federal Departments are jointly involved in this study of the water and related land resource development of the Missouri Basin. Specific and more detailed studies will result from the framework study, rather than information on specific development works with sufficient detail for Congressional authorization.

The Mid-Continent Region is now conducting a recreation reconnaissance study of the proposed Bureau of Reclamation Moorhead Reservoir Project, which would be located on the Powder River in Montana and Wyoming. The report will contain recommendations that recreation be considered as a project purpose, that recreation development be cost-shared by Federal and non-Federal interests under provisions of P.L. 89-72, the Federal Water Project Recreation Act, and that a more detailed recreation study be conducted if Congress authorizes a "feasibility" report.

The source of the Bureau's funding for most water resource planning work in Montana is the Missouri River Basin Project Fund.

Pacific Northwest Region

1. **General Nature and Objectives of Work.** The Bureau's activities in the field of Federal water resource planning and development stem primarily

from the Bureau's Organic Act of 1963 (P.L. 88-29) and the Federal Water Project Recreation Act of 1965 (P.L. 89-72).

The Bureau participates in coordinated comprehensive river basin planning, and studies are conducted to determine outdoor recreation potentials and to assure that recreation, natural beauty, and the quality of the total environment are adequately considered in the basin plans.

The Bureau also participates in individual water resource project studies which usually involve Federal projects under consideration by the Bureau of Reclamation, the Corps of Engineers, or the Bureau of Indian Affairs. These studies include the collection, assembly, and analysis of outdoor recreation information which is used by the appropriate authorities in formulating water resource development plans. The Bureau also reviews reports of other Federal agencies directly related to prospective water resource development projects. It cooperates with the Federal Power Commission and its licensees in their development of plans to provide for appropriate public recreational use of FPC projects, now and in the future.

These investigations and evaluations are for the purpose of meeting the needs of the people as outlined in comprehensive statewide recreational plans and the nationwide recreational plan. Other than a small amount of transfer money from the Bureau of Reclamation used in conjunction with its studies of the Missouri River Basin, water resource investigations within the State of Montana, is within the direct appropriations to the Bureau of Outdoor Recreation. Thus, the completion of the programmed water resource studies, listed below, are dependent upon future appropriation levels.

2. **Specific Water Resource Studies Within the State of Montana.**

a. **Studies Completed in Fiscal Year 1968**

Name: Blackfeet Irrigation Project, Montana.
Lead Agency: Bureau of Indian Affairs.
Type of Study: Reconnaissance.
Nature of Study: Individual Water Project.
Date Completed: November, 1967.

Name: Fort Benton Unit, Missouri River Basin Project, Montana.
Lead Agency: Bureau of Reclamation.
Type of Study: Feasibility.
Nature of Study: Individual Water Project.
Date Completed: June, 1968.

b. **Studies Programmed for Completion in Fiscal Years 1969 through 1972**

Name: Libby Reregulating Project, Montana.
Lead Agency: Corps of Engineers.
Type of Study: Feasibility.
Nature of Study: Individual Water Project.
Tentative Completion Date: F.Y. 1969.

Name: Marias Milk Unit, Missouri River Basin Project, Montana.
Lead Agency: Bureau of Reclamation.
Type of Study: Feasibility.
Nature of Study: Individual Water Project.
Tentative Completion Date: F.Y. 1969.

Name: Missouri-Yellowstone Tributaries, Missouri River Basin Project, Montana.
Lead Agency: Bureau of Reclamation.
Type of Study: Reconnaissance.
Nature of Study: River Basin Investigation.
Tentative Completion Date: F.Y. 1969.

Name: Sidney Investigations, Missouri River Basin Project, Montana.
Lead Agency: Bureau of Reclamation.
Type of Study: Reconnaissance.
Nature of Study: Individual Water Project.
Tentative Completion Date: F.Y. 1970.

Name: Columbia-North Pacific Comprehensive Framework Study.
Lead Agency: Pacific Northwest River Basins Commission.
Type of Study: Framework (Type I)
Nature of Study: Comprehensive River Basin (Interagency Study).
Tentative Completion Date: F.Y. 1972.

Bureau of Reclamation

Regional Office, Region 6, Billings

The following statement on water resource programs conducted by the Bureau in Montana east of the continental divide include:

1. Summary of Water Resources Programs in Montana for Region 6. This includes a tabulation of proposed and potential projects of the Bureau of Reclamation which was taken from the Bureau's annual report.

2. Summary of Bureau of Reclamation programs for fiscal years 1967 and 1968, and estimate of fiscal year 1969 program now being considered

by the Congress. This includes programs of both Regions 1 and 6 of the Bureau and the Bureau-wide Atmospheric Water Resources Research program.

Programs for future years are being developed and information will not be available until the program has been submitted to the Congress. The planning and operation and maintenance functions are expected to run about the same level for the next year, with some reduction in planning upon completion of studies now underway. The level of construction during the future years will, of course, depend on authorization of new units and a more favorable fiscal situation.

Because many of the functions apply to more than one State, it is difficult to determine man-years applicable to program activities for each State. Currently, about 220 employees have been assigned principally to activities in Montana. About one-half of these are assigned to operation and maintenance functions at Canyon Ferry, Fort Peck, Yellowtail, Helena, and Dillon. These figures do not include the Regional Office staff at Billings which, in addition to performing supervisory functions, performs direct work on Montana projects not assigned to a field office, assists the field office in direct work, and performs various centralized functions.

All appropriations for programs are made through the Public Works Appropriation Act except parts of programs which are financed from advances by the water users or from contributed funds.

1. Summary of water resources program.

(a) **Missouri River Basin Project**

The Missouri River Basin Project was authorized by the Flood Control Act of 1944 as supplemented and extended by the Flood Control Act of 1946 and later acts. Reauthorization of individual units on which construction had not been started in 1964 is required under current legislation.

Current water resource activities of the Bureau of Reclamation from the Missouri River Basin Project involve planning for new units completion or continuation of construction for specific units, and operation and maintenance for completed units.

Planning

Annual appropriations for the Missouri River Basin Project provide for the continued planning of potential developments. Current long range schedules show for the Montana portion of the project a potential irrigable acreage of a half million acres associated with about 40 multipurpose units; these were identified in the initial plan or in later studies. Investigations are of three types—reconnaissance, basin surveys, and feasibility investigations.

Reconnaissance investigations are made to evaluate the various alternative possibilities for resource developments in an area and to determine, with a minimum of time and funds, whether more detailed studies are warranted.

Reconnaissance investigations are currently underway on the Moorhead Unit, which involves a re-examination of plans for Moorhead Dam and Reservoir. Completion of a report is scheduled for fiscal year 1969.

Basin surveys, which may precede or follow a reconnaissance survey, are made to evaluate the basin resources, appraise the needs and opportunities for development of those resources and formulate a comprehensive and coordinated plan to guide future studies of specific pro-projects. Included in this program is the comprehensive framework study of the water and related land resources of the Missouri River Basin to review and update development plans in light of the steady progress that has been made in the development, use, management, and conservation of the basin's water and related land resources. This is a cooperative endeavor between the States and the Federal agencies involved in water resource development and is being carried out under the auspices of the Missouri Basin Inter-Agency Committee. A report on the study is scheduled to be completed in fiscal fear 1969. More specifically in Montana, the Bureau of Reclamation is also studying the Missouri-Yellowstone tributaries in order to update information on units in the Upper Missouri and Yellowstone River Basins where basin planning has not kept pace with that in the remainder of the basin. Studies are being made for the Helena-Great Falls, Judith and Three Forks Division in west-central Montana and for the Lower Bighorn Division in the Yellowstone Basin; a report is to be completed in fiscal year 1970. Basin surveys have been completed on the Northeast Mon-

tana Division, located between Fort Peck Dam and the Montana-North Dakota State Line, and a report will be completed in fiscal year 1969.

Feasibility investigations, which normally are a follow-up of a reconnaissance or basin investigation, are made to develop and refine the engineering and operating plans for potential units and to determine whether these developments have engineering and financial feasibility and economic justification. Feasibility investigations are currently underway for the Marias-Milk Unit, which would irrigate some 75,000 acres in the Marias and Milk River Basins from Tiber Reservoir, with a report scheduled for completion in fiscal year 1970. Feasibility investigations will be initiated for the Hardin Unit, which would irrigate about 43,000 acres from Yellowtail Reservoir; report is scheduled for completion in fiscal year 1970. Feasibility investigations will be completed in fiscal year 1969 for the Fort Benton Unit and the Sun-Teton Unit. Favorable reports for the Jefferson-Whitehall Unit and the West Bench Unit were completed in previous years and at this time are in various stages of processing prior to proceeding with a request for authorization of the units for construction. Feasibility investigations for the Lower Musselshell Unit and the Cracker Box and Stipek Units were concluded during the past year with a status report showing that authorization could not be recommended at this time.

Reports resulting from feasibility investigations are reviewed by the States of the Missouri River Basin and Federal agencies. Upon completion of a report showing that a project has engineering feasibility and economic justification, and is desired by the project beneficiaries, recommendations are made for authorization of the unit for later construction.

New reconnaissance, basin survey, and feasibility investigations are requested from time to time by potential water users. An investigation is scheduled when budgetary considerations permit their inclusion in the planning program and requests are made to the Congress for funding. Specific authorization by the Congress of a feasibility investigation is required under present legislation.

Construction

Following authorization of a unit and execution of necessary repayment contracts covering the reimbursable costs, requests for construction funds are made to the Congress and upon approval, construction is initiated.

Units of the Missouri River Basin Project which have been completed for service in Montana are the Canyon Ferry, Crow Creek Pump, Helena Valley, Lower Marias (Tiber Dam and Reservoir part), Savage, and Yellowtail Units and various transmission line and substation facilities of the Transmission Division.

Construction is currently underway and will continue for three more years on minor completion work on the Yellowtail Unit, which was placed in service in 1966. Minor completion work is also continuing, including canal lining and drainage construction, for the Crow Creek Pump, East Bench, and Helena Valley Units, which were also placed in service in prior years. Remedial work in connection with the spillway for Tiber Dam and Reservoir of the Lower Marias Unit is underway with completion of the first phase of construction scheduled for 1969. Initiation of construction of a transmission line from Great Falls to Browning is under consideration and would be completed in a three-year period if approved.

The outlook for new construction in the area will depend on budgetary considerations, authoriaztion of units, and the support of the prospective water users. Authorization of the proposed West Bench and Jefferson-Whitehall Units would permit recommending construction in the next few years. Similarly, completion of feasibility investigations and authorization of the proposed Marias-Milk Unit would permit scheduling of construction within the next five or six years.

Operation and Maintenance

When a unit is ready for service, the operation and maintenance function of the irrigation features of the project are continued by the Bureau of Reclamation until turned over to the water users, in accordance with provisions of repayment contracts. Multipurpose features, such as dams and reservoirs, and power facilities are operated by the Bureau of Reclamation.

Units under operation and maintenance by the Bureau of Reclamation are Canyon Ferry, Crow Creek Pump, East Bench, Helena Valley, Lower Marias (Tiber Dam and Reservoir), and Yellowtail Units, and features of the Transmission Division. The Savage Unit is being operated by the water users.

(b) **Other Projects**

Although included within the boundaries of the Missouri River Basin, several projects were completed prior to authorization of the Missouri River Basin Project. Some other activities are funded out of other than Missouri River Basin Project appropriation requests.

Planning

Special investigations were completed in fiscal year 1968 for power interties between projects. Planning programs are being proposed for a study of bank protection requirements along the Yellowstone River adjacent to the Lower Yellowstone Project; for general studies in connection with assistance, as required by the State of Montana, in preparation of a State water plan; and for an ecnomic analysis of resource areas. These programs will be included in future schedules for funding as soon as budgetary considerations permit.

Construction

Projects for which construction has been completed in prior years are the Buffalo Rapids, Fort Peck (transmission lines and substations), Huntley, Intake, Milk River, Lower Yellowstone, part of the Shoshone, and the Sun River Projects.

Minor construction work, consisting of extension of drains, is underway on the Buffalo Rapids Project and will continue foı three or four years. Reconstruction of Paradise Valley Diversion Dma on the Milk River Project was completed in the past year. Other construction which has been active in Montana has been in connection with repair of damage caused by the 1964 flood to non-Bureau projects and included reconstruction of Swift Dam and Lower Two Medicine Lake Dam, as well as irrigation facilities of the Pondera County Canal and Reservoir Company, Brady Irrigation Company, and Bynum Irrigation District.

Operation and Maintenance

Projects for which construction has been completed are operated by the water users except for the principal storage and supply works of the Milk River Project and power transmission features of the Fort Peck Project.

Also included in this program is a continuation of a Soil and Moisture Conservation program involving Bureau projects. Included are such measures as revegetation, erosion control, and studies of water use.

Project Headquarters

Billings, Montana, is headquarters of Region 6 of the Bureau of Reclamation which covers the State of Montana east of the Continental Divide, all of the States of North Dakota and South Dakota, northeastern Wyoming, and portions of Iowa, Minnesota, and Missouri. The employees stationed in the Regional Office provide supervisory services for the entire region, assist field offices in performance of direct work, and make specific studies in the water resource and related fields.

(c) **Potential and Proposed Projects.**

2. Summary of programs for fiscal years 1967 and 1968 and estimate for 1969. This includes programs for Region 1 and 6 as well as the Bureau-wide Atmospheric Water Resources Research program.

Regional Office, Region 1, Boise, Idaho

The following are summaries of two projects currently under study in the Columbia Basin in Montana.

1. Project: Columbia-North Pacific Region
   Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming.

Location

The Columbia-North Pacific Region encompasses all of the Columbia River Basin, the coastal streams of Oregon and Washington, including Puget Sound Basin, and that part of the Closed Basin within the borders of the State of Oregon.

Description

The basic obpective of this study is the formulation of a framework plan, in cooperation with State and other Federal agencies engaged in water conservation and related activities, to provide a broad

POTENTIAL RECLAMATION PROJECTS

(Projects for which a planning report has not been completed)

June 30, 1967

State and Project	Irrigable Acres		Municipal & Industrial Water Supply (Acre-feet annually)	Power Development (Kilowatts)
	Full	Supplemental		
MONTANA				
Bitterroot Valley Project	1,700	48,300	----------	----------
Blackfoot River Project				
Ninemile Prairie Dam, Reservoir, and Powerplant	----------	----------	----------	60,000
Deer Lodge Valley Project	22,800	20,000	----------	----------
Flathead River Project	150,000	----------	----------	730,000
Gold Creek Project	1,000	2,000	----------	----------
Kleinschmidt Flat Project	7,800	----------	----------	----------
Little Blackfoot-Cottonwood Project	----------	3,000	----------	----------
Missoula Valley Project, North Side Division	----------	1,200	----------	----------
Nevada Northside Project	2,200	----------	----------	----------
Plains Project	7,000	----------	----------	----------
Race Track Creek Project	----------	3,000	----------	----------
Sunset Valley Project	2,000	----------	----------	----------
Missouri River Basin Project				
Allenspur Unit	----------	----------	----------	250,000
Alzada Unit	9,000	----------	----------	----------
Battlefield Unit	1,200	----------	----------	----------
Benteen Flat Unit	1,600	----------	----------	----------
Brush Unit	1,000	----------	----------	----------
Cameron Bench Unit	4,000	3,100	----------	----------
Chestnut Valley Unit	4,600	----------	----------	----------
Clarkston Unit	1,000	----------	----------	----------
Crackerbox Unit	1,700	----------	----------	----------
Crow Unit	1,200	----------	----------	----------
Dunmore Unit	11,400	----------	----------	----------
Elm Coulee Unit	2,000	----------	----------	----------
Farmer Creek Unit	1,600	----------	----------	----------
Fort Benton Unit	----------	----------	----------	300,000
Gallatin Unit	----------	59,100	----------	----------
Glasgow Bench Unit	9,300	----------	----------	----------
Haley Unit	2,400	----------	----------	----------
Hardin Unit	42,600	1,000	----------	----------
Hardscrabble Unit	2,200	----------	----------	----------

POTENTIAL RECLAMATION PROJECTS—(Continued)

State and Project	Irrigable Acres		Municipal & Industrial Water Supply (Acre-feet annually)	Power Development (Kilowatts)
	Full	Supple-mental		
Hobson Unit	----------	6,000	----------	----------
Huntley Extension Unit	1,800	----------	----------	----------
Lewistown Unit	4,000	----------	----------	----------
Little Bighorn Unit	----------	14,800	----------	----------
Lower Powder Unit	58,500	----------	----------	----------
Madison Unit	12,600	13,600	----------	----------
Marias-Milk Unit	75,000	120,000	----------	----------
Marsh Unit	2,800	----------	----------	----------
Missouri Diversion Unit	92,800	----------	----------	----------
Moorhead Unit	----------	----------	----------	----------
N-Bar-N Unit	7,200	----------	----------	----------
Newlan Unit	3,900	----------	----------	----------
Nichwall Unit	2,800	----------	----------	----------
Nohle Unit	1,700	----------	----------	----------
Rock Creek Unit	1,000	200	----------	----------
Ross Fork Unit	3,000	----------	----------	----------
Seven Mile-Sitting Bull Unit	6,500	----------	----------	----------
Seven Sisters Unit	3,200	----------	----------	----------
Shoestring Unit	1,200	----------	----------	----------
Shotgun Unit	12,500	----------	----------	----------
Sidney Unit	1,000	----------	----------	----------
Stipek Unit	3,800	----------	----------	----------
Sun-Teton Unit	27,300	3,700	----------	----------
Wyola Unit	3,600	----------	----------	----------
Yellow Bluff Unit	1,300	----------	----------	----------
Total—Montana	618,800	179,000	----------	1,340,000

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

PROPOSED RECLAMATION PROJECTS

June 30, 1968

(Projects for which a favorable planning report has been completed)

State and Project	Irrigable Acres		Municipal & Industrial Water Supply (Acre-feet annually)	Power Development (Kilowatts)
	Full	Supplemental		
MONTANA				
Missouri River Basin Project				
Jefferson-Whitehall Unit	49,600	14,600	----------	----------
West Bench Unit	----------	6,400	----------	----------
Total—Montana	49,600	21,000	----------	----------

Appropriation, Activity and Project	Fiscal Year 1967	Fiscal Year 1968	Fiscal Year 1969
General Investigations			
Atmospheric Water Resources Research	$ 26,000	$ 70,000	$ 110,000
Flathead Project	123,116	107,000	38,700
Basins, Reconnaissance & Other	49,839	84,002	----------
Subtotal—General Investigations	$ 198,955	$ 261,002	$ 148,700
Construction and Rehabilitation			
Bitter Root Jroject (R&B)	81,700	----------	----------
Buffalo Rapids Project	4,386	13,000	30,000
Missouri River Basin Project			
Crow Creek Pump Unit	3,281	9,000	36,000
East Bench Unit	239,328	337,000	265,000
Helena Valley Unit	149,915	189,000	165,000
Lower Marias Unit	----------	2,500,000	1,790,000
Transmission Division	134,500	70,000	558,000
Yellowtail Unit	3,459,826	4,012,000	2,919,000
Investigations			
Feasibility Investigations			
Billings Pump Unit	5,321	----------	----------
Cracker Box and Stipek Units	4,236	5,800	----------
Fort Benton Unit	74,877	79,600	3,000
Hardin Unit	----------	----------	40,000
Jefferson-Whitehall Unit	2,631	----------	----------
Lower Musselshell Unit	12,900	----------	----------
Marias-Milk Unit	165,174	186,000	52,000
Sun-Teton Unit	31,972	7,000	----------
West Bench Unit	10,812	10,600	----------
Basins, Reconnaissance & Other	244,135	338,900	356,000

Appropriation, Activity and Project	Fiscal Year 1967	Fiscal Year 1968	Fiscal Year 1969
Paradise Valley Irrigation District	289,724	4,000	----------
Recreation Facilities at Existing Reservoirs	2,479	5,000	14,000
Subtotal—Construction and Rehabilitation	$ 4,917,197	$ 7,766,900	$ 6,228,000
Operation and Maintenance			
Hungry Horse Project	543,226	587,000	608,000
Milk River Project	46,201	49,000	51,000
Missouri River Basin Project	2,444,974	2,750,000	2,882,000
Purchase Power and Wheeling	12,225	39,000	50,000
Soil and Moisture Conservation	235,284	266,800	261,000
Subtotal—Operation and Maintenance	$ 3,281,910	$ 3,691,800	$ 3,852,000
Total	$ 8,398,062	$11,719,702	$10,228,700

guide to the best use, or combination of uses, of water and related land resources of the Columbia-North Pacific Region to meet foreseeable short-and long-term needs. This study will be a framework of reconnaissance-type investigation intended to:

(a) provide broad-scaled analyses of water and related land resources, and

(b) furnish general appraisals of the probable nature, extent, and timing of measures for their solution.

It will consider all geographic areas within the study region and all purposes served by the conservation, development, and use of water and related land resources. The details of framework study will be limited to those necessary to meet the above requirements.

Status

The study was initiated in November 1965. During the past years the activity was directed towards securing basic data on use of land and water ,identification of irrigated land and locating potential irrigible land areas.

In FY 1969 the Bureau of Reclamation's activities will consist of the following:

1. review and completion of the final drafts of the Irrigation Appendix;
2. continued work on graphic presentations for the Irrigation Appendix;
3. work will continue on development and analysis of data for evaluation and formulation of framework plans;
4. coordination of Bureau's activities in working with other lead agencies and work groups concerned with other parts of the overall study effort will be continued.

Completion Date: Fiscal Year 1971.

Funding: Direct appropriation by the Congress (Public Works)

	Total	Cost to 6-30-68	FY 1969	Balance to Complete
Costs (estimate)	$1,935,000*	$972,000	$482,000	$481,000
Man-years (estimate)	147.4	74.1	36.7	36.6

Note: Actual costs by States are not available, however, on a percentage basis the amount allocated to Montana would be approximately 13 percent of the totals shown above.

* Regional total Bureau of Reclamation only. Includes transfers to other Department of Interior Agencies

Remarks

Field coordination of the overall Columbia-North Pacific study is being handled by a technical staff composed of members from the Department of Agriculture, Army and Interior, under the Pacific Northwest River Basins Commission.

2. Project: Flathead River Project, Montana.

Location

Encompasses the Flathead River Basin in Flathead, Lake and Sanders Counties in northwestern Montana.

Description

The objective of this investigation is to develop a comprehensive plan, in cooperation with the Corps of Engineers and other Federal agencies engaged in water conservation and related activities, for the best use or combination of uses of remaining water and related land resources of the Flathead River Basin. Of the potential irrigable land in the project area, considerable local interest has been shown in irrigation development of about 26,000 acres ih tne Stillwater area.

Status

The Flathead River Basin was covered briefly in the 1959 survey report on the Clark Fork River Basin. In April 1961 a special report was prepared on Spruce Park Dam and Reservoir on the Middle Fork of the Flathead River. Following the disastrous flood in the spring of 1964, work was started on updating the information on the Spruce Park Dam and Reservoir and a reconnaissance of two alternate dams and reservoirs on the North Fork at the Smoky Range and Glacier View sites.

In October 1965 the Secretary of the Interior requested the Bureau of Reclamation to broaden the scope of the studies to a comprehensive study of the Flathead River Basin. The reports for the Northern Division and Spruce Park have been deferred but these sites will be given full consideration in the overall comprehensive basin plans.

Evaluation studies have been made of alternative basic plans of development at Buffalo Rapids No. 2 and No. 4 and Sloan Bridge.

Formulation cost estimates have been completed on alternative sources of water supply for the Stillwater Division including:

1. storage in Tally Lake on Logan Creek,
2. storage at Star Meadows site on Logan Creek and,
3. pumping from Flathead River.

A detailed classification of lands in the Stillwater Division has been completed.

Completion Date: A Special Report, which will be a compilation of all available data on water and related land resource development possibilities in the Flathead River Basin, will be completed in FY 1969. Concurrent with the following preparation of the Special Report, feasibility studies will be done on the Stillwater Division. A feasibility report on a multiple-purpose plan of development for the Stillwater Division will be completed in FY 1971.

Funding: Direct appropriation by the Congress (Public Works)

	Total	Cost to 6-30-68	FY 1969	Balance to Complete
Costs (estimate)	$513,000	$373,000	$69,700	$70,300
Man-years (estimate)	38.9	28.3	5.3	5.3

Federal Water Pollution Control Administration

This agency is actively working in both the Columbia River and Missouri River Basins but a breakdown for the Montana portion is reported to be not possible. Comprehensive reports of these studies are made occasionally, the next one for the Columbia Basin to be published by 1 April 1969 on a program begun in 1961.

Specific studies reported as active in Montana include:

This year a study will be made on the Flathead Lake. This is being done at the request of the Montana State Department of Health to determine the present bacteriological quality of the lake. The study will take 6 weeks and will cost about $8,000.

Every five years this Administration updates the municipal waste inventory for the Nation. This is being done this year. Although the information is compiled by this Administration, much of the data for Montana will be provided by the State Department of Health. No cost figures are available.

Our water quality surveillance system has the following stations which are sampled at least monthly:

River	Station
Kootenai	Libby, Montana Leonia, Idaho Port Hill, Idaho
Clark Fork	Deer Lodge, Montana Garrison, Montana Missoula, Montana Alberton, Montana
Bull River	Plains, Montana Bull River Cutoff, Montana Troy, Montana Lake Creek, Montana Middle Fork, Montana Ross Creek, Montana

Testing includes the D.O., P.H., conductivity, alkalinity, delayed millipore filter for coliforms, temperature, turbidity, color, sulphates and chlorides. These tests are not exclusive of others which may be also performed where conditions warrant. Tests of samples obtained from the Clark Fork include those for certain metals.

The State of Montana has been receiving a state program grant for many years. For FY 1968 the State received a Federal grant of $38,514. This sum was given to the Montana State Department of Health to strengthen the water pollution control program. Federal construction grants for the State of Montana have been available since FY 1957. The total available for FY 1968 was $1,478,900.

A research grant has been given to the University of Montana for the "Detection Significance of Enzoatic Water Pollution." The study has been in progress since 1965 and is being conducted through 1969.

U.S. Geological Survey

Water Resources Division

The water resources investigation program of the U. S. Geological Survey consists of the collection of basic water information through the hydrologic data network, areal hydrologic or interpretive studies, and research. The basic data collected, studies, and research findings are presented in publications of the U. S. Geological Survey and State agencies and in technical journals and other publications.

Much of the work is a cooperative effort in which planning and financial support are shared by State and local governments and other Federal agencies. In Montana, various parts of the program are conducted in cooperation with the Montana Water Resources Board, Montana Bureau of Mines and Geology, State Fish and Game Commission, State Highway Commission, Endowment and Research Foundation at Montana State University, Wyoming State Engineer, U. S. Bureau of Reclamation, U. S. Army Corps of Engineers, U. S. Department of State, U. S. Bureau of Indian Affairs, U. S. Bureau of Land Management, Bonneville Power Administration, and the Montana Power Company and Washington Power Company as licensees of the Federal Power Commission.

The hydrologic data network of the Geological Survey is summarized in tabular form below. Daily records include those from continuous recorders and others for which individual observations or measurements are sufficiently frequent to indicate day to day variations. Periodic records are those observed at somewhat regular though infrequent intervals (monthly, quarterly, annually).

Type of water record	Frequency of Measurement: Daily	Frequency of Measurement: Periodic
Streamflow stations		
Primary (long term hydrologic)	91	
Secondary (short term areal hydrologic)	19	
Water Management (specific purpose)	97	
Peak discharge only (crest stage)		196
Peak and low flows		3
Suspended sediment discharge	12	3
Chemical quality	18	8
Temperature	27	3
Reservoirs		
Reservoir content	16	30
Ground-water records		
Water levels	1	92
Precipitation records		
Total (rain gage)	5	
Snow (water content)		18

In addition to the data network listed above, stream temperatures are measured at approximately monthly intervals at all stream-gaging stations in the State. Quality-of-ground-water data for many areas are not included in the regular basic data compilation but are published in ground-water reports by the U. S. Geological Survey and by the Montana Bureau of Mines and Geology. Miscel-

laneous spot sampling of stream flow, water quality, and suspended sediment are made throughout the State for supplementary data and while not included in the above tabulation, are published in the regular basic data compilations.

Areal studies of the water resources of six selected areas, with special emphasis on ground-water, are being made by Survey personnel. Drainage studies of differing degrees of intensity and size are being made on five irrigation projects operated by Interior Department agencies in the Missouri basin part of the State. Studies that are Statewide in scope are being made of peak floodflow characteristics of small drainage areas. Studies of the hydraulic characteristics of selected highway bridge sites are also being made. A compilation of surface-water temperature data collected from all known sources of data throughout the State is nearing completion.

Funds available for the program of the Geolocical Survey in Montana during the Fiscal Year ending June 30, 1968 amounted to $682,000. Of this amount $137,925 was contributed by State agencies of which $115,125 was eligible for matching in like amount by the Geological Survey under cooperative agreements. The balance of approximately $429,000 was from the Geological Survey and other Federal agencies. During the same year, about 45 man-years of effort were expended on the program. No increase in personnel is anticipated in the Fiscal Year beginning July 1, 1968 and staff additions beyond that time will be dependent on the availability of funds.

Activities of other divisions of the Geological Survey are directed toward the study of the leasable minerals, coal, oil, gas, oil shale, phosphate, sodium and potassium minerals, native asphalt and bitumen; the classification of the public lands on which these minerals occur; and the furnishing of geologic data to those branches of the Geological Survey that supervise the leasing of the public lands for the extraction of mineral. In connection with this work, we make geologic maps in areas with leasable minerals: Hence, we have no programs directed exclusively toward water resources.

In connection with the above described work, however, we do collect a great deal of data on water. An individual well record is kept of each test for oil and gas in Montana, on which is noted any information on water encountered during the drilling and testing of the well. We are currently engaged in the preparation of geologic maps of sixteen 7½-minute quadrangles in the Jordan area. Purpose of this mapping is to provide a basis for the study of coal and oil and gas resources, but the resulting geologic maps, structure contour maps, measured stratigraphic section and geologic cross sections are useful in the study of the occurrence and movement of ground water. Another of the U.S.G.S. functions is the geologic examination of dam and reservoir sites in which public lands are involved. Geologic maps and reports have been prepared on quite a number of dam sites in the past, but none are scheduled for this present fiscal year. However, additional work is contemplated in the future.

Since the collection of data on water is more or less incidental to this work on the leasable minerals, it is impossible to estimate what percent of the U.S.G.S. annual budget goes toward this function.

RIVER BASINS COMMISSION AND AGENCIES

The Missouri Basin Inter-Agency Committee

The Missouri Basin Inter-Agency Committee was established in April, 1945, by the Federal Inter-Agency River Basin Committee in Washington, D. C. The Committee was organized when it became apparent, following the passage of the 1944 Flood Control Act, that a program coordinating body was desirable to function as a local point to effect a climate of smooth, cooperative relationships between the numerous independent, Federal, State and local agencies engaged in Water and Related Land Resources Planning and Development activities.

Members of the Federal Inter-Agency River Basin Committee had worked since 1943 toward the coordinating of river basin resources development at the National level. A revised charter was issued by the Inter-Agency Committee on Water Resources in 1954. The members of the Missouri Basin Inter-Agency Committee are the Governors of the Ten Basin States and seven Federal representatives for the Department of Army, Corps of Engineers, Department of the Interior, Department of Agriculture, Department of Commerce, Department of Health, Education, and Welfare, Department of Labor and the Federal Power Commission.

The Chairman of the Committee is chosen annually from among the Federal members. The Chairman-Agency provides for the Secretary, Assistant Secretary, and clerical assistance.

Since the first meeting of the Missouri Basin Inter-Agency Committee in July, 1945, it has convened 141 times at various places throughout the Basin States. The Committee now holds regular quarterly meetings.

The Missouri Basin Inter-Agency Committee was charged with the responsibility of establishing means and procedures to promote coordination of Water and Related Land Resources activities of the Federal and State agencies; to promote resolution of the agency problems at regional levels; to suggest to the Inter-Agency Committee on Water Resources and the States' revisions in laws or policies which would promote coordination, or resolution of Inter-Agency problems; and, at its discretion, to communicate with the Inter-Agency Committee on Water Resources or any matters of mutual interest.

The Committee is instructed that its efforts on coordination of work and resolution of conflicts will be directed toward all agencies and State activities involved in their respective water and related land resources development responsibilities and shall include coordination of the following:

1. Collection and interpretation of basic data.
2. Investigation and planning of water and related land resources projects.
3. Programming, including scheduling of water and related land resources construction and development.

Much has been accomplished by the Committee during its 20 year existence in terms of more comprehensive understanding of the various agency-authorized functions and programs, and the continuous exchange of information between State and Federal agencies. Divergent views on water and related resources development problems are heard. A much better public understanding of the many elements of the basin program has been attained. A greatly improved working relationship now exists among all agencies concerned.

Subcommittees

The Committee has established three active permanent subcommittees; namely, the Executive Subcommittee, the Annual Report Subcommittee, the Atomic Energy Subcommittee, and a Standing Committee for Comprehensive Basin Planning.

The Subcommittee on Comprehensive Basin Planning, established at the Vicksburg meeting of the Missouri Basin Inter-Agency Committee on February 20, 1963, reported to the Committee at the June meeting that it would be desirable for MBIAC to undertake a comprehensive framework plan for the Missouri Basin. The Subcommittee prepared a detailed outline of work to be undertaken and prepared an estimate of cost and time required.

In order to implement the framework planning activity the Missouri Basin Inter-Agency Committee in 1964, set up an organization which was intended to utilize the inputs of both the federal and state agencies in the basin.

The organization is as follows:

Standing Committee

Executive Group
5 Task Forces

Work Group on Economic Base Study
8 Task Forces

Work Group on Needs and Problems
7 Task Forces

Work Group on Hydrologic Projections
7 Task Forces

Work Group on Land Availabilities

Work Group on Water and Related Land Resource Development
9 Task Forces

Most of the Task forces have completed their assignments. The first draft of the framework plan is expected to be available for review in mid July, 1969.

Pacific Northwest River Basins Commission

To summarize, when established in March, 1967, the PNWRBC assumed coordination functions for three river basin studies previously under the coordination guidance of the Columbia Basin Inter-Agency Committee. These are the Puget Sound and Adjacent Waters; the Willamette Basin; and the Columbia-North Pacific studies. They are founded directly by federal agencies and, to a limited extent, by state participants. The schedule calls for completion of the Puget Sound and Adjacent Waters and the Willamette Basin studies by June 30, 1969, and the Columbia-North Pacific by June 30, 1971. The only Commission funds relative to these three studies are allocations of part of Commission staff salaries. The Commission furnishes the salary and expense for the study technical staff chairman of the Columbia-North Pacific who devotes about 80% of his time to this study. About 25% of the time of a staff planning coordinator for the Puget Sound and Adjacent Waters and Willamette Basin studies is furnished from Commission funds.

The Commission program beyond this is specific in Public Law 89-80 as:

1. engage in such activities and make such studies and investigations as are necessary and desirable in carrying out the policy set forth in section 2 of this Act and in accomplishing the purpose set forth in section 201 (b) of this Act;

2. submit to the Council and the Governor of each participating State a report on its work at least once each year. Such report shall be transmitted through the President to the Congress. After such transmission, copies of any such report shall be sent to the heads of such Federal, State, interstate, and international agencies as the President or the Governors of the participating States may direct;

3. submit to the Council for transmission to the President and by him to the Congress, and the Governors and the legislatures of the participating States a comprehensive, coordinated, joint plan, or any major portion thereof or necessary revisions thereof, for water and related land resources development in the area, river basin, or group of river basins for which such commission was established. . . . The views, comments, and recommendations submitted by each Federal department or agency head, Governor, inter-state agency, and the United States section of the international commission shall be transmitted to the Council with the plan, portion, or revision; and

4. submit to the Council at the time of submitting such plan, any recommendations it may have for continuing the functions of the Commission and for implementing the plan, including means of keeping the plan up to date.

The Commission expenditures to perform the above functions is expected to exceed $200,000 per annum provided on a 50-50 basis by the five member States and by Federal funds appropriated for this purpose. The man-years of work are difficult to estimate. Fifteen to eighteen employees will conduct the staff effort, but the plan of study contemplates staff being loaned to perform work on the studies relevant to a state or federal agencies program over and above this. At present, the Commission staff is functioning with about seven man-years of capability, pending further recruiting. The comprehensive joint plan is scheduled over the next several years and is not expected to be completed earlier than 1973, although some sub-regions will be developed in detail at an earlier date.

Following completion of a detailed joint comprehensive plan, a program of review, updating and forward planning will continue.

It should be kept in mind that the Pacific Northwest River Basins Commission is basically a coordinating agency with the expenses of all members, including the Chairman, being paid out of other than the staff budget of the Commission. For this reason, there is little relationship between its budgeted expenditures and the obligations it must discharge.

AGENCIES PERFORMING WATER-RELATED AND WATER-DEPENDENT WORK

Montana Department of Fish and Game

Recreation and Parks Division

Early in 1964 the Montana Fish and Game Department was designated by the Governor as the official state recreation agency. This action was further spelled out by the State Legislative Assembly in the passage of the assent to the Land and Water Conservation Fund Act of 1965. (Sec. 62-402, 62-403, Fish and Game Codes, State of Montana). This legislation charged the Fish and Game Department with the responsibility of preparing a comprehensive Statewide Outdoor Recreation Plan and representing the State in the implementation of the Land and Water Conservation Fund Act (1965).

Additional legislation (Sec. 62-301), Fish and Game Codes, moved the administration of the State Parks from the Highway Commission to the jurisdiction of the Fish and Game Commission as of July 1, 1965. Also the Powers and Duties of the Fish and Game Commission (Sec. 26-104) were amended to clarify the handling of surplus lands as well as making possible the acquisition of recreation lands by easement in addition to the already existing authority of purchase or lease.

The Land and Water Conservation Fund Act of 1965 (Public Law 88-578), was signed into law in September 1964. This national legislation provides funds to the states on a 50-50 basis for the development of outdoor recreation programs. For Montana, the apportionment amounts to somewhat less than a million dollars per year.

The Montana Fish and Game Department prepared a Statewide Outdoor Recreation Plan for Montana in the fall of 1965. This represented the first inclusive plan of this kind prepared for the state. It was submitted for approval to the Bureau of Outdoor Recreation as a prerequisite to participation in development and acquisition aspects of the Land

and Water Conservation Fund program. The Plan was approved in late November of 1965. This plan has since been updated and is the basis for a continuing planning project.

The Commission currently has 25 water-based parks under its administration as listed below and also administers more than 100 fishing access sites most of which are also listed.

WATER BASED STATE PARKS

Legend: T—toilet; TA—table; S—stove or fireplace; BL—boat launching possible; W—drinking water; *—development planned.

Location	Name of Park	Boating Area	Campground Capacity—Cars	Facilities
10 mi. s.w. of Bigfork	On Flathead Lake—Woods Bay	190 sq. mi.	----	T. TA. S. BL.
18 mi. s.w. of Chester	Tiber Reservoir Rec. Area	75 sq. mi.	50	T. TA. S. BL. W.
20 mi. s. of Dillon	Clark Canyon Res. Rec. Area	5,000 acres	60	T. TA. S. BL. W.
35 mi. s. of Ft. Peck	Rock Creek State Park On Ft. Peck Reservoir	756 acres	25	T. TA. S.
40 mi. s. of Hamilton	Painted Rocks Res. Rec. Area	500 acres	50	T. TA. S. BL.
29 mi. e. of Harlowton	Deadman's Basin Res. Rec. Area	8 sq. mi.	20	T. TA. S. BL.
20 mi. s.e. of Helena	Canyon Ferry Rec. Area	55 sq. mi.	150	T. TA. S. BL. W.
26 mi. n. of Jordan	Hell Creek State Park On Ft. Peck Reservoir	756 sq. mi.	25	T. TA. S. BL. W.
20 mi. w. of Kalispell	Bitterroot Lake State Park	5 sq. mi.	10	T. TA. S. BL. W.
20 mi. w. of Kalispell	Ashley Lake	3,224 acres	----	T. TA. S. W.
20 mi. s. of Kalispell on Flathead Lake	West Shore State Park	190 sq. mi.	20	T. TA. S. BL. W.
65 mi. n. of Lewistown	James Kipp State Park	100 mi. Missouri River	30	T. TA. S. BL. W.
25 mi. n.e. of Malta	Nelson Res. Rec. Area	7 sq. mi.	20	T. TA. S.
15 mi. n. of Polson on Flathead Lake	Flathead Lake State Park	190 sq. mi.	50	T. TA. S. BL. W.
12 mi. e. of Polson on Flathead Lake	Finley Point State Park	190 sq. mi.	12	*
20 mi. n. of Polson on Flathead Lake	Yellow Bay State Park	190 sq. mi.	12	T. TA. S. BL. W.
30 mi. n.w. of Polson	Lake Mary Ronan	3,800 acres	15	T. TA. S.
2 mi. w. of Thompson Falls	Thompson Falls State Park	7 acres	15	T. TA. S. BL. W.
1 mi. n. of Townsend	Missouri River		----	TA. *
5 mi. n.e. of Three Forks	Missouri River Hdqtrs. State Monument	Missouri River	10	T. TA. S. BL. W.
½ mi. n. of Virgelle	Missouri River Coal Banks Landing	Missouri River	----	*
3 mi. w. of .Whitefish	Whitefish Lake State Park	10 sq. mi.	20	T. TA. S. W.
44 mi. w. of Kalispell	Logan Memorial Park			
13 mi. n. of Polson	Walstad Memorial Park			

FISHING ACCESS AREAS
PROVIDED BY THE MONTANA FISH AND GAME DEPARTMENT

*—Indicates areas which are not developed at this time, February, 1967. However, development work is anticipated during the coming summer months.

Legend: T—toilet; TA—table; S—stove or fireplace; BL—boat launching possible; W—drinking water.

Location From Town	Name of Area	Facilities	Lake Area
Absarokee—Town	Stillwater River	T.	
18 mi. s.w. of Absarokee	Stillwater River, Castle Rock	T. TA. S.	
19 mi. s. of Absarokee	Stillwater River, Moraine	*	
11 mi. s. of Absarokee	Stillwater River, Rosebud Isle	T.	
5 mi. s. of Absarokee	Stillwater River, Cliff Swallow	T. TA. S.	
20 mi. s. of Anaconda	Big Hole River, Sportsman's Park	T. TA. S.	
15 mi. w. of Anaconda	Georgetown Lake		2,800 acres
12 mi. w. of Augusta	Bean Lake	T. TA. S. BL.	268 acres
20 mi. n.w. of Baker	Rush Hall Reservoir	*	
4 mi. s.w. of Belgrade	West Gallatin R., Cameron Bridge	T. TA. S.	
5 mi. n. of Bigfork	Flathead R., Sportsman's Bridge	T. TA. S.	
Town of Bigfork	Flathead Lake, River's End	BL.	
6 mi. e. of Bigfork	Loon Lake		57.3 acres
10 mi. s. of Bonita	Rock Creek—Welcome Creek	T.	
8 mi. s. of Bonita	Rock Creek—Tamarack Creek		
25 mi. w. of Bonner	Blackfoot Dr., Nine Mile Prarie	T. TA. S.	
6 mi. w. of Big Timber	Yellowstone River, Grey Bear	T. TA. S.	
14 mi. w. of Brady	Arod Lake	T. TA. S.	
12 mi. w. of Cameron	Madison River, Varney Bridge	T.	
1 mi. s. of Cardwell	Jefferson River	*	
1 mi. e. of Columbus	Yellowstone River	*	
5 mi. s. of Columbus	Stillwater River, Swinging Bridge	T.	
6 mi. s. of Columbus	Stillwater River, White Bird	T. TA. S.	
1 mi. s. of Columbus	Stillwater River, Fireman's Point	T.	
4 mi. s. of Dillon	Barrat's Campground	T. TA.	
Town of Emigrant	Yellowstone River	T. TA. S.	
14 mi. s.w. of Emigrant	Daily Lake	*	107 acres
4 mi. n.w. of Ennis	Madison River, Valley Garden	T. TA. S.	
4 mi. s. of Ennis	Madison River, Burnt Tree Hole	T.	
6 mi. s. of Ennis	Madison River, Eight Mile Ford	T.	
1 mi. s. of Ennis	Madison River, Ennis	T. TA. S. W.	
8 mi. n. of Ennis	Meadow Lake (Ennis Lake)	T.	3,800 acres
6 mi. n.w. of Eureka	Carpenter Lake	T. TA. BL.	91.4 acres
7 mi. n.w. of Eureka	Sophie Lakes	T. TA. S.	232 acres

FISHING ACCESS AREAS—(Continued)

Location From Town	Name of Area	Facilities	Lake Area
4½ mi. s.w. of Fortine	Loon Lake	*	100 acres
5½ mi. s.w. of Fortine	Marl Lake	*	200 acres
3 mi. n. of Fort Peck	Fort Peck Dredge Cuts	T. TA. BL.	
12 mi. s. of Fromberg	Bluewater Hatchery	T. TA. W.	
30 mi. s. of Gallatin Gateway	Gallatin River and Ramshorn Lake	*	
1 mi. e. of Glendive	Hollecker Pond	T. TA.	10 acres
2 mi. s. of Glen	Big Hole River, Glen	*	
20 mi. w. of Harlowton	Musselshell River, Selkirk	T. TA. S. W.	
12 mi. s. of Havre	Bear Paw Lake	T. TA. S.	
8 mi. e. of Harrison	Harrison Lake	T. TA. S. BL.	868 acres
25 mi. s.w. of Helena	Park Lake	*	35 acres
28 mi. s. of Helena	Tizer Lakes	*	20 acres
6 mi. s.w. of Hobson	Ackley Lake	T. TA. BL.	241 acres
2 mi. e. of Kalispell	Flathead River, Old Steel Bridge	T. BL.	
10 mi. n. of Kalispell	Whitefish River	*	
10 mi. w. of Kalispell	Smith Lake	*	15 acres
10 mi. n.e. of Kalispell	Flathead River Pressentine Bar	*	
5 mi. n.e. of Kalispell	Flathead River Reserve Dr.	*	
5 mi. n. of Lewistown	Lower Carter's Pond		15 acres
6 mi. n. of Lewistown	Upper Carter's Pond	T. TA. S.	15 acres
5 mi. n.e. of Lewistown	Spring Creek	*	
40 mi. s.e. of Libby	Crystal Lake	*	178 acres
8 mi. s. of Livingston	Yellowstone River—Mallard's Rest	T. TA. S. W.	
1 mi. s. of Livingston	Yellowstone River—Paradise	T. TA. S.	
12 mi. e. of Livingston	Yellowstone River—Sheep Mountain	T. TA. S.	
10 mi. n. of Logan	Missouri River—Fairweather	*	
2 mi. e. of Manhattan	Gallatin River, Four Corners	T. TA. S.	38 acres
10 mi. s. of McLeod	Boulder River—Natural Bridge	T.	
15 mi. s.w. of Melrose	Browne's Lake		
12 mi. s. of Miles City	Tongue River	T.	
2 mi. w. of Miles City	Brannum Lake	T. TA. S.	40 acres
.5 mi. n.e. of Nye	Stillwater River—Buffalo Jump	T. TA. S.	
4 mi. w. of Nye	Stillwater River—Limestone	*	
8 mi. s. of Ovando	Blackfoot Dr.—Cedar Meadow	*	
8 mi. w. of Ovando	Blackfoot Dr.—Cottonwood Creek	*	
8 mi. w. of Ovando	Upsata Lake	T. TA. S. BL.	85.4 acres
15 mi. w. of Ovando	Clearwater Crossing	T. TA. S.	
3 mi. w. of Ovando	Monture Creek	T. TA. S.	

FISHING ACCESS AREAS—(Continued)

Location From Town	Name of Area	Facilities	Lake Area
8 mi. n.w. of Ovando	Blackfoot River—Box Canyon	*	
12 mi. w. of Ovando	Blackfoot River—River Junction	T. TA. S.	
4 mi. s. of Ovando	N. Fork Blackfoot R.—Harry Morgan	*	
35 mi. n.w. of Polson	In Flathead Lake—Cedar Island	*	190 sq. mi.
30 mi. n.w. if Polson	In Flathead Lake—Juniper Beach	*	190 sq. mi.
Between Roberts & Red Lodge	Rock Creek—Aspen Park	*	
Between Roberts & Red Lodge	Rock Creek—Beaver Lodge	T.	
Between Roberts & Red Lodge	Rock Creek—Bull Springs	*	
Between Roberts & Red Lodge	Rock Creek—Horsethief Station	*	
Between Roberts & Red Lodge	Rock Creek—Water Birch	T.	
12 mi. n. of Saco	Cole Ponds	T. TA. S.	15 acres
12 mi. s. of Seeley Lake	Harper Lake	T. TA. S. BL.	17.9 acres
15 mi. s.w. of Sidney	Gartside Lake	*	35 acres
19 mi. e. of Shelby	Devon Reservoir	*	
12 mi. s. of Three Forks	Madison River—Greycliff	T.	
3 mi. w. of Thompson Falls	Noxon Rapids	T. BL.	
5 mi. s. of Townsend	Missouri River	*	
4½ mi. s.e. of Troy	Savage Lake	*	108 acres
5 mi. s. of Whitehall	Jefferson River—Parrot Castle	*	
5 mi s.w. of Whitefish	Blanchard Lake	T. TA. S.	147 acres
2 mi. w. of Whitefish	Skyles Lake	*	39 acres
1 mi. s. of Whitetail	Durand Reservoir	T. TA. S.	
18 mi. n. of White Sulphur Sprgs.	Smith River	*	272 acres
20 mi. e. of White Sulphur Sprgs.	Whitetail Reservoir	*	25 acres
3 mi. w. of Willow Creek	Jefferson River—Williams Bridge	*	

The Commission also has a part in acquisition and development of water-based recreation areas controlled by local agencies through administration of the Land and Water Conservation Fund.

The Recreation and Parks Division annual budget devoted to water-based activities is approximately as follows:

Fish and Game Earmarked Revenue Fund	$300,000.00
Land and Water Conservation Fund	225,000.00
.6% of Motor Fuel Tax	130,000.00
General Fund	160,000.00
	$815,000.00

Fisheries Division

Nature and Objectives of the Work

Montana's Fisheries Program has two parts—an action program and a fact-finding program. Both are important to good fisheries management. An action program must be based on facts and facts collected for management must be applied to an action program.

Fact finding in fisheries may vary from general survey (locating and classifying our waters and finding out something about the fish they contain) to research on the genetics or physiology of a single species of fish. Like most state fishery agencies, Montana's fact finding is more concerned with the former,

and the latter is generally left to the colleges and universities. The facts gathered are used as the base for our action program, as rapidly as public acceptance will permit. Our action program is composed of six general jobs. These are:

1. Habitat preservation, restoration and improvement.

An adequate supply of quality water and a natural channel that provides pools, riffles and streambank cover are essential for good stream production of wild trout. Because many of our streams have these qualities, we enjoy some of the best stream-trout fishing in the nation today. Pollution, dewatering and channel straightening have reduced trout production in many of our streams. Preventing such losses by pollution control and working with constructing agencies and individuals to reduce or prevent channel alterations is our most important job for the future of Montana's fishing.

2. Purchase and development of access areas.

To insure that a growing number of anglers will be able to get to their fishing waters, more and more access areas are necessary. The Fish and Game Department presently owns, operates or sponsors about 150 fishing access areas. These sites are being developed and we must continue to purchase additional key sites each year.

3. Population manipulation.

This includes chemically treating waters to remove rough fish populations and restocking with small game fish. It also includes planting small trout in waters where trout are unable to spawn. These plants of small fish, where they have good survival to catchable size, represent the most economical use of our hatchery product.

4. Regulations.

Regulations have generally been more restrictive than necessary. This causes some fish populations to be under-harvested and fishing opportunity for some anglers to be denied at times of the year when it could just as well be allowed. Over the years our regulations have been liberalized—most size limits have been abandoned, more waters have been opened to winter fishing, and many winter seasons have been lengthened.

Good regulations have a definite place in fisheries management. As fishing pressures increase, more intensive fisheries management will be applied and this will include regulations tailored to insure harvests compatible with fish populations.

5. Planting catchable-sized fish.

Most of the catchable-sized trout in Montana are planted in streams to increase the anglers' catch above what the stream would produce naturally. Carryover of planted fish to subsequent years is negligible, therefore they are planted in accessible areas where they have the best chance of being caught soon after planting. This procedure is effective, but expensive and is strictly for improving today's fishing not tomorrow's. Also this type of fishing can be made available almost anywhere and is quite different from the wild, stream-trout fishing for which Montana is famous.

6. Population of nongame fish of little interest to Montana sportsmen represent a natural resource that should be utilized for the total benefit of the state if possible. Commercial fisheries' work in Montana consists of exploring the extent of nongame fish populations, experimenting with selective harvest of these fish, exploring potential markets for these fish, and assisting the commercial fishermen of the state in any way that we can.

Man-Years Involved

The Fisheries Division of the Fish and Game Department expended approximately 64 man-years pursuing its program in fiscal 1967-68. It is estimated that the manpower devoted to this task will increase to about 65 man-years in 1968-69, and to 66 man-years in 1969-70.

Source and Amount of Funding

Federal Aid Projects

The primary source of the funds for these projects is from the Dingell-Johnson Federal Aid to Fish Restoration Act, 64, Stat. 430. One project, the Fort Peck Reservoir Fishery Investigation, is financed by the Commercial Fisheries Research and Development Act, 16 USC 779. Both of these Acts provide three dollars for every dollar of state funds expended. State funds used for these projects are obtained from license revenues and a modest tax placed on commercial fishermen.

Project	Effective Date	Period	Amount
Fish Management Coordination	7- 6-67	5 years	$140,000.00
Statewide Creel Census	6-23-66	3 years	50,637.00
North Central Fish. Study	7-12-66	3 years	69,000.00

Northwest Fish. Study	6-28-66	3 years	86,000.00
Southwest Fish. Study	7-11-67	3 years	135,000.00
Northeast Fish. Study	5-20-65	3 years	80,000.00
West Central Fish. Study	4-11-65	3 years	75,000.00
South Central Fish. Study	4- 5-65	3 years	75,000.00
Rock Creek Creel Census	7-11-67	3 years	25,000.00
Southeast Fish. Study	7-11-67	3 years	40,000.00
Statewide Fish Habitat	6- 8-67	3 years	120,000.00
Helicopter Mt. Lake Survey	7- 6-67	3 years	17,000.00
Flathead Lake Fish. Study	6-10-66	3 years	110,000.00
Reservoir Investigations	2-28-67	3 years	69,000.00
Fort Peck Fish. Investigation	7- 1-66	3 years	60,000.00

These projects are either renewed or extended when the expiration date is reached.

State Projects

The entire cost of state projects is borne by the Fish and Game Department from revenues derived from the sale of licenses.

Project	Approximate Annual Expenditure
General Fisheries Management	
Northwest District	$12,500.00
Western District	11,300.00
Southwest District	11,000.00
North Central District	25,800.00
South Central District	24,700.00
Northeast District	9,000.00
Statewide	27,900.00
Pollution Control—Statewide	18,400.00
Lake & Stream Improvement—Statewide	15,000.00
Water Operation & Maintenance—Statewide	2,000.00

In addition to the above mentioned state projects, the Fish and Game Department also operates eight fish hatcheries at an approximate annual cost of $450,000.00. Hatchery operations are entirely funded by fish and game license revenues.

Game Management Division

Nature and Objectives of the Work

The status of waterfowl is, of course, directly influenced by water resources in the state. The quantity and quality of water in the marshes, potholes, stock ponds, lakes, reservoirs, rivers, and streams will affect waterfowl. Drainage of wetlands, manipulation of water levels and fluctuations of the water resources have very important impact on waterfowl.

Waterfowl programs of the State Department are of two kinds:

(1) To inventory the status of habitat and populations, recommend seasons, and determine harvests;

(2) to develop and manage certain state owned or controlled lands for the production and utilization of the waterfowl resource, and to cooperate with agencies, organizations, etc., which control waterfowl habitat to develop programs beneficial to waterfowl.

Waterfowl inventory jobs include a breeding ground survey to determine trends in water conditions for waterfowl, and numbers of breeding pairs. Waterfowl production is estimated by brood counts during the early summer. Harvest of waterfowl is determined by a questionnaire after the hunting season.

Waterfowl banding is a continuing job to determine movements of waterfowl, learn about population units, and discover the effect of hunting on segments of populations, etc. Flyway management boundaries have been adjusted through these banding studies.

Waterfowl management areas controlled by the state total 10,594 acres owned and 12,640 acres leased. Land and water on these areas are manipulated to primarily benefit waterfowl. The waterfowl management areas are located in Beaverhead, Cascade, Deer Lodge, Lake, Phillips, Richland and Teton counties. The Freezout project, which totals 11,340 acres in Teton county, is the largest waterfowl project of the State Fish and Game Department.

Man-Years Involved

The Game Management Division of the Fish and Game Department expended about ten man-years on waterfowl programs in the fiscal year 1967-68. Most of this work, perhaps 80 per cent, was performed on the operation of waterfowl management areas. It is expected that manpower devoted to waterfowl programs may increase to eleven or twelve man-years in the next five year period.

Source and Amount of Funding

The primary source of the funds for waterfowl programs of the State Fish and Game Department is the Pittman-Robertson Federal Aid in Wildlife Res-

toration Act of 1937. This act provides federal aid funds to reimburse the state for 75 per cent of the cost of approved projects. Federal funds are earmarked revenue of a federal tax on firearms and ammunition. The remaining 25 per cent of State Fish and Game Commission monies is from the sale of hunting licenses.

State waterfowl programs in Montana presently cost about $125,000 annually, 75 per cent of this cost is, of course, from federal aid funds. Again, most of the waterfowl program costs are for operations and development of existing waterfowl management areas.

The waterfowl management program expenditure is expected to increase in the next five year period. The amount of increase will depend on how much development will be accomplished on certain new areas such as Canyon Ferry Reservoir, Warm Springs Ponds, Clark Canyon Reservoir, Three Forks and Hinsdale.

Projects now existing and the approximate annual costs of these projects are given below:

Name	County	Amount
Freezout	Teton	$50,000
Ninepipes	Lake	34,000
Milk River	Phillips	10,000
Fox Lake	Richland	1,000
Warm Springs	Deer Lodge	25,000

U.S. Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife

Activities, in Montana, of the Divisions of Fish Hatcheries, Wildlife Refuges, Fishery Services, and of River Basin Studies are included in the following summary.

With the exception of funds earned on refuges (through sales of hay, grazing fees, and other sales or services), funds for these Divisions originate as congressional appropriations.

The Division of Fish Hatcheries operates hatcheries at Bozeman, Ennis, Creston and Miles City, rearing both trout and warmwater fishes which are released in waters of the State in an effort to improve sport fishing. Current operations require about 24.3 man-years and $336,000 annually.

The Division of Wildlife Refuges administers the following installations in Montana:

Benton Lake National Wildlife Refuge

This refuge (12,383 acres) is located in Cascade and Choteau counties, about 8 miles north of Great Falls. The primary objective is the production of waterfowl. Of next importance is provision of food and protection for birds during migration. Depredation control is also a consideration of management. Land use consists of water impounding, farming and grazing. Management of water to maintain surface levels that will be conducive to the production of aquatic food plants and emergent cover plants provides nesting habitat on 5,614 acres of marsh and water. Cereal crops are produced on a portion of 900 acres of agricultural land. Approximately 13,000 acre-feet of irrigation return water is pumped from Muddy Creek, near Power, through 5 miles of pipe and 13 miles of open ditch to the refuge.

Also administered from Benton Lake Refuge are two smaller areas, Pishkun and Willow Creek National Wildlife Refuges. Pishkun Refuge consists of 8,195 acres located on Bureau of Reclamation Pishkun Reservoir 15 miles southwest of Choteau. Both areas provide waterfowl habitat primarily for nesting and feeding. The Willow Creek National Wildlife Refuge (3,119 acres) is also on a Bureau of Reclamation reservoir approximately 5 miles north of Augusta. Both of these units will probably soon be abandoned as waterfowl refuges.

From $100,000 to $120,000 are expended annually in maintaining the three refuges. Approximately 7.6 man-years are involved.

Bowdoin National Wildlife Refuge

This is a major refuge of the Central Flyway located in the Milk River Drainage, Phillips county, near Malta; 15,500 acres, consisting of 7,600 acres of water and marsh. Most of the water area is in two large shallow lakes, Bowdoin Lake and Dry Lake. This is a major waterfowl production area and is also important for feeding and resting of waterfowl. An estimated 7,000 acre-feet of water is supplied to the refuge annually by the Bureau of Reclamation.

Small waterfowl refuges administered from Bowdoin include Black Coulee, 1,480 acres, Blaine county; Creedman Coulee and Lake Thibadeau Refuges, 2,728 and 3,509 acres, respectively, Hill county; and Hewitt Lake Refuge, 1,681 acres, Phillips county. These areas provide nesting, resting, and protection for waterfowl.

About $50,000 and 5 man-years are expended annually in management of the five refuges.

Charles M. Russell National Wildlife Range

This 951,062-acre game range and refuge is located on U. S. Corps of Engineers Fort Peck Reservoir and adjoining public lands. This area extends from Fort Peck Dam upriver, an airline distance of 125 miles, and averages about six miles in width. It provides habitat for sharptailed and sage grouse, turkeys, antelope, elk, deer, and bighorn sheep. Portions of the reservoir provide nesting, resting, and feeding areas for waterfowl.

The following lesser waterfowl areas are administered from the Range: Hailstone and Halfbreed Lake National Wildlife Refuges, 2,240 and 3,097 acres, respectively, Stillwater county; Lake Mason National Wildlife Refuge, 18,173 acres, Musselshell county; and War Horse National Wildlife Refuge, 3,192 acres, Petroleum county.

About $215,000 to $235,000 and 20 man-years are involved in the annual operation of these areas.

Medicine Lake National Wildlife Refuge

Located 2 miles south of Medicine Lake; contains 31,457 acres primarily of open water and grassland which provide nesting, resting, and feeding habitat for waterfowl and native upland game birds. About 550 acres of cereal crops are produced to provide supplemental feed to waterfowl. Cattle grazing is permitted on a portion of the area.

The Lamesteer National Wildlife Refuge, a small nesting and feeding waterfowl area of 800 acres, is administered by the Medicine Lake staff. This refuge is located in Wibaux county.

Between $45-$60,000 and 6.5 man-years are spent annually in administering these two areas.

National Bison Range

This refuge is located 6 miles north of Dixon. It contains 18,541 acres of grasslands and partly timbered hills which are devoted primarily to the perpetuation of the buffalo but also supports elk, deer, bighorn sheep, and antelope.

Also administered by Bison Range personnel are the Ninepipe and Pablo National Wildlife Refuges. The Ninepipe area is located on Indian Irrigation Service Ninepipe Reservoir, 9 miles north of St. Ignatius. This 2,022-acre refuge is primarily for waterfowl. The Pablo unit, 2,542 acres in size, lies on the Pablo Reservoir within Lake county. This unit provides waterfowl nesting and feeding habitat.

Total annual expenditures for the complex approach $100,000. About 11.5 man-years are expended.

Ravalli National Wildlife Refuge

This relatively new area to accommodate migratory waterfowl consists of 2,720 acres and is located near Stevensville. Management involves reclamation and restoration of marsh habitat. Water impoundments are provided for aquatic plant food production. About 400 acres of cropland are farmed for waterfowl food consumption. The water used in management of this area stems from seeps, irrigation waste, and overflow from the Bitterroot River.

Between $50-$70,000 and about 5 man-years are required annually to operate the refuge.

Red Rock Lakes National Wildlife Refuge

This 39,943-acre refuge is located 30 miles east of Monida at the base of the Centennial Mountains. The refuge includes about 13,000 acres of shallow lakes, marshes, and meadows. It was established mainly for the protection and propagation of the rare trumpeter swan. It also provides habitat for other waterfowl as well as the Shiras moose and other big game animals.

Water use on the refuge stems from water right on 25 tributaries flowing through the refuge.

About 7 man-years and $70,000 are expended annually.

Ul Bend National Wildlife Refuge

This area, presently being acquired, consists of 56,936 acres and is located about 70 miles south of Malta. The primary purpose of the refuge will be provision of habitat to accommodate waterfowl nesting. Approximately 80,000 acre-feet of water will be pumped from the Missouri River to establish waterfowl marshes.

After development an estimated 5 man-years and $55,000 will be required annually to operate the refuge.

In addition to the above refuges the Bureau has recently purchased 1,400 acres on scattered sites within Sheridan county to be used for waterfowl production areas. The waterfowl production area program could ultimately result in the purchase of 25,000 additional acres of land and wetlands and in obtaining easements on 25,000 additional acres of land and wetlands. These small pothole areas would

be located within Daniels, Roosevelt, Sheridan, Chouteau, Toole, Glacier, Hill, Phillips, and Lake counties.

The Kalispell Fisheries Services Field Office is headquarters for the majority of Fishery Services activities in Montana. This office provides technical assistance to Indian tribes about the State, which activity thus far has been directed primarily to the Blackfeet Indian Tribe. Other Indian tribes about the State have been receiving a limited amount of technical assistance and fish for planting from the National Fish Hatcheries, and it is expected that activities will need expansion in the near future because of the recent request of the Flathead Indian Tribe for services of this Division on their Reservation. Other tribes that have received assistance are on the Fort Peck, Northern Cheyenne, Rocky Boy, and Fort Belknap Indian Reservations. On several of these areas significant recreational industries around fishery waters have developed and are providing economic benefits, as well as creating fishing opportunities in areas of local scarcity.

Glacier National Park has great potential for expansion of its fishery program, and the Kalispell office has been working on a limited budget to provide minor assistance to this important area. One man-year and $15,000 are expended annually by the Kalispell office.

The Cooperative Fishery Unit established at Montana State College, Bozeman, is a joint venture involving the Bureau of Sport Fisheries and Wildlife, Montana Department of Fish and Game, and the College. The training of fishery scientists for professional employment, research programs oriented toward maintaining and improving sport fisheries of the area, and extension type activities are the primary functions of the Unit. The Unit Leader and student activities have dealt heavily with the effects of dewatering on aquatic environment and trout population, and the effects of sewage effluent on the aquatic invertebrates. Two man-years and $40,000 of Federal funds are involved annually.

In accordance with provisions of the Fish and Wildlife Coordination Act, the Division of River Basin Studies investigates and reports on proposed water-development projects of the Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, and Bureau of Indian Affairs, and projects involving permits issued by the Federal Power Commission, U. S. Forest Service and Atomic Energy Commission. The purpose of such studies is to determine the probable impact of proposed projects on fish and wildlife resources and to recommend means and measures of preventing losses and, wherever possible, of improving conditions for these resources and opportunities for people to utilize and enjoy them. These studies are carried out in close cooperation with the Montana Fish and Game Commission.

Due to the specialized nature of its responsibilities, the Division does not propose water-development projects of its own; it studies projects proposed by other agencies. Now programmed for fiscal years 1969 and 1970 is the Corps of Engineers' Libby project on which about 2/3 of a man-year and $8,000 will be expended annually. Also programmed for fiscal years 1969 and 1970 is the Bureau of Reclamation-Corps of Engineers joint study of Clark Fork River Basin on which the Division expects to expend $4,000 and 1/3 man-year in FY 1969 and $5,000 and 2/5 man-year in FY 1970.

In accordance with provisions of the Fish and Wildlife Coordination Act, this office studies and reports on proposed water-development projects in the Missouri River Basin of the Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, and Bureau of Indian Affairs, and projects involving permits issued by the Federal Power Commission, U. S. Forest Service and Atomic Energy Commission. The purpose of these studies is to determine the probable impact of proposed projects on fish and wildlife resources, and to recommend means and measures of preventing losses and wherever possible, of improving conditions for these resources and opportunities for people to utilize and enjoy them. These studies are carried out in close cooperation with the Montana Fish and Game Commission.

Due to the specialized nature of our responsibilities, we do not propose water-development projects of our own; we study projects proposed by other agencies. Our funds are received entirely through Federal appropriations. As a guide to the level of our efforts, our funding during the past two fiscal years amounted to approximately $54,000 each year for work in Montana.

The Columbia-North Pacific Region Comprehensive Framework Study is a coordinated effort of the various Federal, State, and local interests responsible for development and operation of water and related land resources. It includes that part of Montana west of the Continental Divide. The objectives of this study conform with the guidelines for framework studies as issued by the Interdepartmental Staff Committee, ad hoc Water Resources Council. This framework study is a preliminary or reconnaissance type inves-

tigation intended to provide broadscale analyses of water and related land resource problems and to furnish general appraisals of the probable nature, extent, and timing of measures for their solution.

The study considers all geographic areas within the study region and all persons served by the conservation, development, and use of water and related land resources. The details are limited to those necessary to meet the requirements as outlined above. The guidelines provided through the framework study will determine the need for more specific study, both as to scope and time, by the various agencies undertaking developments in the field.

No specific improvements are expected to be recommended for construction through this study. Studies of such developments which will be needed within the immediate future may be undertaken by the appropriate agency through various authorities available to them.

Proposed studies by the Division of River Basin Studies comprise the following:

1. review existing information regarding fish and wildlife distribution, habitat, fishing and hunting use, and resource data;
2. determine measures for conservation and development of fish and wildlife;
3. coordinate all studies closely with those of other State and Federal agencies to develop a comprehensive plan for fish and wildlife.

The study will be completed on June 30, 1970. In the remaining study time, the BSF&W will spend an estimated ¼ man-year and $3,000 in connection with the Montana part of the study.

Undoubtedly the Division will be involved in a number of additional projects in Montana, usually short term and on too short notice to permit programming. We shall not attempt to estimate the magnitude of these.

ASSOCIATIONS AND TECHNICAL SOCIETIES

Greater Marias Milk River Development Association

Missouri River Development Committee

The following statement was supplied by Mr. Lou Lawrence, Chairman of the Committee:

We feel that what happens in future development in North Central Montana will depend on what happens on the Marias, the Milk, and the Missouri Rivers. The three rivers are tied together with High Cow Creek dam and reservoir the key.

We feel that only multi-purpose full utilization of Montana's water resources will provide maximum benefit toward the future development of Montana.

Irrigation

The Milk River, faced with the loss of 40 percent of its flow to Canada (which Canada now is getting ready to take under the terms of an old treaty), is short of supplemental water during years of drought for its existing projects. There is a large acreage in the Malta-Glasgow area wanting water for new irrigation projects and it is faced with a real problem. The area is looking toward Tiber Dam to provide the solution by inter-basin transfer. The recently organized Greater Marias-Milk Development Association, with members from Shelby to Glasgow, is working for this goal.

The original Lower Marias group is also active at this time with 62,000 acres in the west half of the original project signed up for reinvestigation. As time goes by and the need for water becomes more apparent there is no doubt a conflict of interest will develop between the Lower Marias and the Milk River, in fact, it could develop into a bitter fight because there won't be enough water to go around.

A solution to this problem would be the construction of High Cow Creek reservoir, which would require a 104 foot lift and a six mile pipe line to put Missouri water into Big Sandy Creek and gravity flow it to the Milk River.

Our County Agent, George Erickson, of Fort Benton, in an independent survey, estimates a potential 600,000 acres in Choteau county could eventually be irrigated if the Fort Benton and High Cow Creek dams are built.

We would like to see Tiber kept for what it was originally intended for and let Missouri water provide all the water the Milk would ever need by inter-basin transfer; rather than to inter-basin transfer this water to Texas.

We feel strongly that Montana cannot afford to lose this water and the future opportunities it would provide.

Power

We feel Montana is rapidly running out of power. Our local REA (Hill County Electric) has a commitment of firm power through 1970. Montana Power is asking for a 15 percent increase to construct new

facilities. Cost of operating their new coal plants is one factor. If Montana coal reserves are going to be developed for thermal plants, High Cow Creek dam will be needed for a peaking dam. We feel High Cow should be built and half the power reserved for use in Montana.

Industry

We feel that one of the factors involved in attracting industry to Montana is cheap power and a body of water.

Tax Base

We feel Montana cannot afford to lose 230,000 acres to a wilderness complex compared to 77,500 acres to High Cow, plus the loss of an increase in tax base that would result in multi-purpose development.

Tourist Trade

We feel we cannot allow reservoir based recreation such as Gavins Point at Yankton, South Dakota, and Oahe at Pierre, South Dakota, each attracting a million visitors a year and settle for a Wilderness Area, which, in spite of all the national publicity —TV programs, stories, editorials, etc., is attracting less than 500 people a year into the area.

We feel that Montana cannot leave all this potential development go without putting up a fight for it.

If the Department of Interior's Missouri Breaks National River Plans go through, we feel Montana will have lost much and gained very little, if anything. We feel this water and its benefits are worth working for.

Montana Association of Soil and Water Conservation Districts

This is an important, independent organization of Soil and Water Conservation District Supervisors contributing to the development of water resources. It has an active Water Resources Committee, which promotes various water programs, legislation, and education information. This organization puts in many man-hours and money in their efforts. Quoting from its articles of association: "This Association is organized to plan, promote, and consummate a comprehensive system of soil and water conservation through soil conservation districts for the entire State of Montana. To that end it shall cooperate with the State Soil Conservation Committee and other organizations working for the same objectives on either an area, statewide, regional or national basis."

The Montana Association of Soil and Water Conservation Districts has made an inventory of Resource Conservation and Development Needs which includes many water practices, and an inventory of Private Recreation Enterprises.

The State Soil Conservation Committee works very closely with the Montana Association of Soil and Water Conservation Districts.

Montana Conservation Council, Inc.

Purpose

To promote wide use of Montana's soil, water, grass, mineral, timber, wildlife and recreational resources for the maximum benefit of this and future generations.

To stimulate cooperative conservation action by Montana people interested in achieving beneficial use, without waste, of the State's natural resources.

To serve as a public forum for the study and discussion of specific Montana conservation needs and problems.

To stimulate effective resource conservation instruction and training in Montana schools and colleges.

To initiate, develop and sponsor conservation programs and services.

Programs

The Council: Schedules an annual conference and planning meeting attended by conservation-minded individuals and group representatives from all parts of the State.

Conducts an annual Conservation Trailride.

Sponsors an annual state-wide Conservation Week.

Assists in the planning and conduction of conservation educational courses and workshops.

Prepares and publishes conservation handbooks and other resource reference material and a quarterly newsletter.

Supports state and federal legislation and appropriations necessary to promote the purpose of the organization.

Montana Water Congress

The objectives of the Montana Water Congress are:

(1) To provide an opportunity for all Montana organizations to join in the general effort to develop and promote a practical program to beneficially use the water resources of the State of Montana.

(2) To provide for the establishment of a common meeting ground for all Montana organizations interested in Montana's water use with those agencies of the State and Federal governments and those research and information agencies of the State University System.

(3) To collect, organize, disseminate and promote ideas, and research in the field of water resources, use and development.

(4) To hold regular meetings especially for the exchange of information and programming for Montana water policy.

(5) To encourage all Montana organizations interested in Montana's water resources to maintain a high degree of activity in each of their respective fields of interest in Montana water development.

(6) To provide a clearing house for coordination with all other Montana groups interested in the use of water for urban, industry, power, recreation, fish and game, and agricultural purposes.

(7) To prepare and maintain a directory of Montana organizations interested in the beneficial use of water.

During this session of the legislature, the Water Congress endeavored to assist in reviewing bills and proposals which were submitted to the Legislature. The Congress appointed a legislative committee consisting of 12 to 15 members from various walks of life.

The Congress does not spend a large sum of money because it is operating on a modest budget. The only cost it has incurred to date are those for postage and telephone calls. Each member of the organization has been taking care of any personal expenses such as travel, meals, etc.

Montana Water Development Association

This organization was set up primarily to perform educational and promotional functions regarding the State's water development. As a part of the National Reclamation Association, it is concerned with legislation as it affects both State and National development.

The Association is not engaged in formulating any specific plans or programs as such, but rather it reviews the work of the various private and governmental agencies in an effort to assist and guide them in developing the best overall programs.

SUMMARY OF DISCIPLINES OR AREAS OF WORK AND FUNCTIONS

Water resources work now being accomplished in Montana may be categorized into the following disciplines or areas of work:

(1) General water resource development, planning and research.

(2) Project planning, development, and management.

(3) Development for agriculture.

(4) Water quality control.

(5) Forest and watershed management.

(6) Water-related and water-dependent activities, including primarily recreation and fish and wildlife activities.

Table II in the last section of this report shows the expenditures and manpower applied in these areas of endeavor.

General Water Resources Development, Planning and Research

Of the fourteen state agencies doing some kind of water resources work, seven are involved in category one but only one agency, the Montana Water Resources Board, is primarily occupied with general water resources development including coordination of all development and planning for the State. Five agencies, including the Montana Highway Department, the College of Mineral Science and Technology, the Montana State University, the University of Montana and the Montana Universities Joint Water Resources Research Center, are primarily concerned with research. The Montana Legislative Council formulates bills relating to water resource regulation and development.

Of the fourteen federal agencies spending considerable sums of money on water resources programs (see Table 1), seven operate in this area, primarily in planning (U. S. Forest Service, U. S. Corps

of Engineers, Department of Commerce, U. S. Bureau of Reclamation) and research (Department of Commerce, Bonneville Power Administration, Bureau of Mines and the U. S. Geological Survey).

Project Planning, Development and Management

This category includes primarily larger projects now built or under study or construction by construction agencies. The only state agency with responsibility here is the Montana Water Resources Board, which has built about 181 projects and operates and maintains those still functional. Federal agencies involved are the U. S. Bureau of Reclamation and U. S. Corps of Engineers, both of which have built and are building large projects. By far the greatest amount of money and man-power devoted to water resources development is consumed by these projects. In FY 1968 more than $70,000,000 and 3,000 man-years were expended with $54,000,000 and about 1,800 man-years attributed to the project Libby Dam in northwestern Montana.

Although regarded as a category separate from the others in this section, a considerable but unestimated part of this work and associated funds are directed toward some other activity properly assigned to them. For example, a considerable part of this work benefits agriculture directly and it certainly contributes to flood control (a general benefit), watershed management, water quality control and recreation, fish and wildlife.

Development For Agriculture

Four state agencies, including the Montana Water Resources Board, State Soil Conservation Committee, State Soil and Water Conservation Districts, and the Montana Cooperative Extension Service contribute directly to development for agriculture. Four federal agencies primarily, and almost exclusively, work in the agricultural field (Agricultural Research Service, Agricultural Stabilization and Conservation Service, Soil Conservation Service and the Farmers Home Administration, all part of the U. S. Department of Agriculture). Expenditures for water for agriculture in the State are second in magnitude to that on large construction projects. Funds spent by the Northern Cheyenne Tribal Council support agricultural endeavor.

Water Quality Control

The Montana State Health Department and Montana Water Pollution Control Council are the two chief state agencies working in the water quality control field. They are assisted by two federal agencies, the Federal Water Pollution Control Administration (U. S. Department of Interior), and the Department of Health, Education and Welfare.

Forest, Range and Watershed Management

One state agency, the State Forester, and two federal agencies, the U. S. Forest Service (U. S. Department of Agriculture) and the Bureau of Land Management (U. S. Department of Interior) conduct significant programs in this area. Some contributions are made in this field by the Bureau of Reclamation and by U. S. Department of Agriculture divisions, including the Agricultural Research Service and the Soil Conservation Service.

Water-Related and Water-Dependent Activities

These activities, which include recreation and fish and wildlife programs are considered separately because they cannot be treated in the same manner as work in other fields of water-resource development. In Montana most of the work in this area is handled by one State agency, the Department of Fish and Game, and two Federal agencies, the Fish and Wildlife Service and the Bureau of Outdoor Recreation. Some water management and development is accomplished by the first two but very little is presently done by the Bureau of Outdoor Recreation.

Distribution of Work By Functions

Water resources work may be classified by function as well as by area or discipline. The five functions recognized by this report include:

(1) Administration and regulatory

(2) Management and development

(3) Operation and maintenance

(4) Planning

(5) Research, education and information

These are arbitrarily selected but form quite natural classes in analysis of distribution of work in water resources in Montana. Expenditures and man-years applied are shown in Table III in the last section of this report.

Administration and regulatory, which includes such activities as coordination of water resources work, overseeing appropriation of water, adminis-

tration of the water laws and activities such as data collection and specific research, which supports the administrator in his decisions, is primarily practiced by the Montana Water Resources Board and the State Health Department, and is supplemented by the work of four other State agencies (Montana Legislative Council, State Forester, State Soil Conservation Committee and State Soil and Water Conservation Districts) and one Federal agency, the U. S. Geological Survey. Some research carried on by various agencies in the University System and by the Montana Universities Joint Water Resources Research Center is also useful to administrative and regulatory activities.

Management and development includes all water use and construction, including feasibility studies and planning of specific projects. As such it constitutes the single largest area of expenditure of both funds and manpower. State agencies primarily concerned here are the Montana Water Resources Board and the State Health Department. The Northern Cheyenne Tribal Council manages use of water on the reservation. Federal agencies involved include the U. S. Corps of Engineers, Bureau of Reclamation, Agricultural Stabilization and Conservation Service, U. S. Forest Service, Soil Conservation Service, Department of Health, Education and Welfare, Bureau of Land Management, Bureau of Mines, Federal Water Pollution Control Administration and the U. S. Geological Survey.

Operation and maintenance is primarily concerned with already constructed projects and involves primarily one State agency, the Montana Water Resources Board, and two Federal agencies, the U. S. Corps of Engineers and the Bureau of Reclamation.

Water planning includes, not only comprehensive planning on a State or regional level, but also some project planning. Comprehensive water planning is practiced by the Montana Water Resources Board and at the regional level by the U. S. Corps of Engineers and the Bureau of Reclamation through the Pacific Northwest River Basins Commission and the Missouri Basin Inter-Agency Committee. Other planning is practiced by these agencies and others, including the Department of Planning and Economic Development, State Health Department, State Soil Conservation Committee, Farmers Home Administration and the Forest Service.

The greater part of research, education and information is accomplished by the University System and the Joint Water Resources Research Center. Others contributing to this function include the Water Resources Board, State Department of Health, State Highway Department, Montana Cooperative Extension Service, all State agencies, and, among Federal agencies, the Agricultural Research Service, the U. S. Forest Service, the Department of Commerce, the Bonneville Power Administration and the Federal Water Pollution Control Administration.

ANNUAL COST AND SOURCES OF FUNDS FOR THE PROGRAMS (FY 1968)

The inventory shows that for fiscal year, 1968, twelve state agencies and fourteen federal agencies had available nearly $88,500,000 to support water resources development in Montana (Table 1). A little more than $3,000,000 was expended by one State and one Federal agency for water-related and water-dependent activities, such as, recreation and fish and wildlife, for a grand total of about $91,500,000. Of this total about $7,500,000 was supplied by private sources for cost-sharing projects relating to agricultural conservation. The greatest portion of all funds was expended by the U. S. Corps of Engineers chiefly for construction. Thus, from a total of about $57,750,000, $54,000,000 was spent on the Libby Dam project and much of the remainder on small flood control projects. The second greatest sum—about $11,750,000—was expended by the U. S. Bureau of Reclamation also on construction, primarily in rehabilitation, repair, and operation and maintenance of various projects. Altogether a total exceeding $70,000,000 was spent directly on construction and maintenance of individual projects. Table 1 shows the agencies, key numbers for the agencies, the source and amount of funds and the approximate man-years involved in water resources development in Montana.

Expenditures according to discipline or area, agencies performing the work, and estimated man-years for each discipline are shown in Table 2. The agencies involved are indicated by key numbers shown in Table 1. In fiscal year 1968 the greatest amount of money—over $70,000,000—was spent on project planning, management and development (includes construction and operation and maintenance). The second greatest amount, about $13,000,000, was expended on development for agriculture, and the third greatest—over $3,000,000—was spent on recreation, fish and wildlife.

Expenditures, man-years of effort, and agencies involved by function for fiscal year 1968 are shown in Table 3. Management and development (including construction) is by far the largest expense utiliz-

ing over $81,000,000 and operation and maintenance, utilizing about $4,000,000 is the second largest. Administration and regulatory functions, which include presumed coordination of all of the programs, is by far the smallest, totaling only about $320,000. This figure is only 0.35 percent of the total program and 0.4 percent of the total excluding water-related activities.

Significance of the Cost of the Program

Clearly Federal government agencies and operations dominate water resources development in Montana and, according to existing and predicted budgets, have dominated in the past and will dominate the picture in the foreseeable future. Estimated budgets for the next three years show clearly that individual project planning, development and management (about $70,000,000 in FY 1968) will be in the same order of magnitude. If we can assume that the completion of the Libby project will be overlapped or closely succeeded by construction of the Jefferson-Whitehall project (Reichle Dam and associated works), then the same pattern and order of magnitude of expenditure can be expected for at least five years or longer. Obviously these structures are to be built and they must be considered basic constituents of the State Water Plan. Other large project planning has been accomplished in a number of areas in the State. Presently actual construction is believed to be far in the future on such large projects. With this in mind it is to be expected that these projects will be carefully considered in the State Water Plan and quite likely significant changes will be recommended for some or all of them. In other words, more efficient and comprehensive coordination of water resources programs is indicated for the future, even though by its very nature construction of large projects must remain within the province of the Federal Government.

Therefore, it would appear that proportionately more funds and time will be devoted to the administrative and regulatory, planning and research functions and to the area of general water resources development, planning and research in the future. Presently it is felt that state planning (about $841,000) and state research (about $1,850,000) are reasonably well funded and well manned and that only proportionately small increases are indicated for the near future. On the other hand, if adequate and efficient coordination of the overall water resource program is to be accomplished, administrative funds to support the work should be materially increased, probably to between one percent and three percent of the overall program cost.

In the construction of projects area, as discussed previously, large projects will probably remain largely in the province of the Federal Government, although some may be financed by other means. However, small projects (projects involving storage between a few thousand and possibly 100,000 acre-feet should be within the capacity of the State to build, and could result in the maximum water development effort in the next ten to fifty years. The Montana Water Resources Board and its predecessor, the State Water Conservation Board, has thoroughly demonstrated the ability to construct and maintain such projects and the State has been highly successful in financing them in the past. The record of past projects show that by the investment of about $10,000,000, all of which will have been repaid in the 1970's, structures now worth about $40,000,000 were built and are owned by the State. These structures over the past 25 years have returned total tangible benefits estimated in the order of $380,000,000, plus intangibles (i.e., recreation, flood control, etc.), which bring the total estimate of all benefits to about $500,000,000. Estimates for five proposed projects which are almost ready for construction and all compatible with the State Water Plan, amount to a cost of $4,000,000 and indicate benefits after construction of about $11,000,000 annually or about $440,000,000 of total benefits. With this technical and financial capability it is hoped that State Contributions to construction will materially increase in the foreseeable future. Such construction will automatically result in increases in operation, maintenance, rehabilitation and repair costs as well, so that total contributions from the State in the foreseeable future should materially increase. Obviously, construction and use of water storage and management projects places the best claim possible on water now leaving Montana largely unused and thus satisfies the aim of the Water Plan to conserve and utilize the most water for the benefit of the people of the State.

TABLE 1

SUMMARY OF WATER RESOURCE AGENCIES WITH SIGNIFICANT PROGRAMS IN MONTANA, FY68

Key Number	Agency	Source of Funds State	Source of Funds Federal	Total Funds	Man-Years
1	State Health Department (Incl. Water Pollution Control Council)	$ 90,000	$ 38,500	$ 128,500	8.30
2	Montana Legislative Council	(1) 5,000	0	(1) 5,000	0.50
3	Montana Water Resources Board	919,542	(2) 196,700	1,116,542	63.05
4	State Forester	(1) 3,000	0	(1) 3,000	0.50
5	State Highway Department	8,300	15,700	24,000	1.00
6	State Soil Conservation Committee	70,000	0	70,000	1.50
7	State Soil and Water Conservation Districts	(3) 33,900	0	(3) 33,900	2.00
8	College of Mineral Science and Technology	58,200	(2) 58,700	116,900	10.00
9	University of Montana	21,000	88,000	109,000	8.00
10	Montana State University	202,000	616,000	818,000	50.00
11	Montana Cooperative Extension Service	0	17,500	17,500	3.00
12	Montana Universities Joint Water Resources Research Center	37,100	153,200	190,300	16.50
13	Northern Cheyenne Tribal Council (6)	0	12,700	12,700	1.00
	TOTAL FOR STATE AGENCIES	1,448,342	1,197,000	2,645,342	165.35
14	Agricultural Research Service (U.S.D.A.)	0	180,000	180,000	6.00
15	Agricultural Stabilization and Conservation Service (U.S.D.A.)	(4) 7,451,000	2,928,000	10,379,000	400.00
16	Farmers Home Administration (U.S.D.A.)	0	18,000	18,000	1.50
17	Forest Service (U.S.D.A.)	0	341,600	341,600	21.70
18	Soil Conservation Service (U.S.D.A.)	0	2,342,000	2,342,000	289.00
19	Corps of Engineers (Dept. of the Army)	200,000	57,559,500	(5) 57,759,500	2000.00
20	Department of Commerce (ESSA)	0	90,000	90,000	3.00
21	Health, Education and Welfare	0	12,000	12,000	0.40
22	Bonneville Power Administration	0	145,000	145,000	5.50
23	Bureau of Land Management	0	907,000	907,000	35.00
24	Bureau of Mines	0	25,000	25,000	2.00
25	Bureau of Reclamation	0	11,720,000	11,720,000	1000.00
26	Federal Water Pollution Control Administration	0	1,487,000	1,487,000	100.00
27	U. S. Geological Survey	0	429,000	429,000	45.00
	TOTAL FOR FEDERAL AGENCIES	$ 7,651,000	$78,184,100	$85,835,100	3909.10
	GRAND TOTALS	$ 9,099,342	$79,381,100	$88,480,442	4074.45

Footnotes:
(1) Estimated
(2) Includes U. S. Geological Survey Cooperative Funds
(3) County Funds
(4) Private Funds for cost sharing administered by a Federal Agency
(5) Includes $54,300,000 for Libby Dam Project
(6) Included under State funds for convenience

WATER-RELATED AND WATER-DEPENDENT ACTIVITIES

28	State Fish and Game	$ 1,320,550	$ 592,850	$ 1,913,400	74.00
29	U. S. Fish and Wildlife Service	0	1,099,000	1,099,000	87.00
	TOTAL	$ 1,320,550	$ 1,691,850	$ 3,012,400	161.00
		$10,419,892	$81,072,950	$91,492,842	4235.45

TABLE 2

WATER RESOURCES AGENCIES, FUNDS, AND MAN-YEARS BY AREA OR DISCIPLINE, FY 68

Area or Discipline Involved	Agencies Involved	Total Funds	Man-Years (Estimated)
General Water Resources Development, Planning, and Research	2, 3, 5, 8, 9, 10, 12, 17, 19, 20, 22, 24, 25, 27	2,560,224	193.20
Project Planning, Development, and Management	3, 19, 24	70,143,518 (1)	3021.00
Development for Agriculture	3, 6, 7, 11, 13, 14, 15, 16, 18	13,053,100 (2)	704.00
Water Quality Control	1, 21, 26	1,627,500	108.70
Forest, Range, and Watershed Management	4, 17, 23	1,101,000	45.50
Fish, Wildlife and Recreation	28, 29	3,012,400	161.00

Footnotes:

(1) Includes $54,300,000 for the Libby Dam Project
(2) Includes $7,451,000 of private funds from cost sharing administered by a Federal Agency

TABLE 3

SUMMARY OF WATER RESOURCES AGENCIES, FUNDS AND MAN-YEARS BY FUNCTION, FY 68

Function	Agencies Involved	Total Funds	Man-Years (Estimated)
Water Resources Agencies			
Administration and Regulatory	1, 2, 3, 4, 6, 7, 27	320,584	22.5
Management and Development	1, 3, 13, 15, 17, 18, 19, 21, 23, 24, 25, 26, 27	81,256,742 (1)	3413.4
Operation and Maintenance	3, 13, 19, 25	4,219,592	480.0
Planning	1, 3, 6, 16, 17, 19, 25	841,384	37.5
Research, Education and Information	1, 5, 8, 9, 10, 11, 12, 14, 17, 20, 22, 26	1,847,100	115.0
Water-Related Activities			
(Fish, Wildlife and Recreation)			
Administration, Regulation, Management and Development	28, 29	2,700,600	137.0
Planning	28	36,800	4
Research, Education, Information	28	275,000	20

Footnote:

(1) Includes $7,451,000 private funds for cost sharing and $54,300,000 for Libby Dam Project.